SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

Master of Computer Applications

CURRICULUM and SYLLABI

[For students admitted in 2022-2023]

MCA Regulation 2020

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA I Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA101	Problem Solving Techniques Using C*	1	0	2	2	45
2	P20MCA102	Computer Organization and Architecture	3	0	0	3	45
3	P20MCA103	Python Programming	3	0	0	3	45
4	P20MCA104	Data Structures and Algorithms	3	1	0	4	60
5	P20MCA105	Relational Database Management Systems*	2	0	2	3	60
6	P20MCA106	Mathematical Foundations for Computer Applications	3	1	0	4	60
		Practical					
7	P20MCA107	Python Programming Laboratory	0	0	4	2	60
8	P20MCA108	Data Structures and Algorithms Laboratory	0	0	4	2	60
9	P20MCA109	Soft Skills and Aptitude Career Enhancement Laboratory - I	0	0	2	1	30
* Laboratory Integrated Theory					**Total Credits**	24	

Approved by

Chairperson, MCA BOS
Dr.T.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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MCA II-Sem

Courses of Study for MCA II Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA201	Operating Systems	2	0	0	2	30
2	P20MCA202	Computer Networks	2	0	0	2	30
3	P20MCA203	Internet Programming	3	0	0	3	45
4	P20MCA204	Cloud Computing Technologies	3	0	0	3	45
5	P20MCA205	Data Science*	3	0	2	4	75
6	P20MCA206	Mobile Application Development	3	0	0	3	45
7	noc23-cs46	NPTEL Course: Object Oriented System Development using UML, Java And Patterns	3	0	0	3	45
	noc23-cs50	NPTEL Course: Programming in Modern C++					
		Practical					
8	P20MCA 207	Internet Programming Laboratory	0	0	4	2	60
9	P20MCA208	Cloud Computing Technologies Laboratory	0	0	4	2	60
10	P20MCA209	Soft Skills and Aptitude Career Enhancement Laboratory - II	0	0	2	1	30
*Laboratory Integrated Theory				**Total Credits**		25	

Approved by

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Member Secretary, Academic Council
Dr.R.Shivakumar 1/3/23

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Dr.S.R.R.Senthil Kumar

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Sona College of Technology, Salem
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Courses of Study for MCA III Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA301	Embedded Systems and Internet of Things	3	0	0	3	45
2	P20MCA302	Cyber Security Essentials	2	0	0	2	30
3	P20MCA303	Artificial Intelligence and Machine Learning	3	0	0	3	45
4	P20MCA501	**Elective: Agile Technologies**	3	0	0	3	45
5	P20MCA512	**Elective: Advanced Web Programming ***	2	0	2	3	60
6	P20MCA513	**Elective: Microservices and DevOps**	3	0	0	3	45
	P20MCA534	**Elective: Digital Marketing**					
		Practical					
7	P20MCA304	Embedded Systems and Internet of Things Laboratory	0	0	4	2	60
8	P20MCA305	Artificial Intelligence and Machine Learning Laboratory	0	0	4	2	60
9	P20MCA306	Mini Project Laboratory	0	0	4	2	60
10	P20MCA307	Soft Skills and Aptitude Career Enhancement Laboratory - III	0	0	2	1	30
* Theory course with Laboratory Component					**Total Credits**	24	

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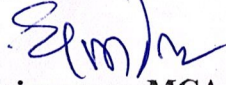Dr.S.R.R.Senthil Kumar

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Courses of Study for MCA IV Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Practical					
1	P20MCA401	Project Work	0	0	24	12	360
					Total Credits		12

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Sona College of Technology, Salem
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Courses of Study for MCA I Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA101	Problem Solving Techniques Using C*	1	0	2	2	45
2	P20MCA102	Computer Organization and Architecture	3	0	0	3	45
3	P20MCA103	Python Programming	3	0	0	3	45
4	P20MCA104	Data Structures and Algorithms	3	1	0	4	60
5	P20MCA105	Relational Database Management Systems*	2	0	2	3	60
6	P20MCA106	Mathematical Foundations for Computer Applications	3	1	0	4	60
		Practical					
7	P20MCA107	Python Programming Laboratory	0	0	4	2	60
8	P20MCA108	Data Structures and Algorithms Laboratory	0	0	4	2	60
9	P20MCA109	Soft Skills and Aptitude Career Enhancement Laboratory - I	0	0	2	1	30
* Laboratory Integrated Theory					**Total Credits**	24	

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P20MCA101 – PROBLEM SOLVING TECHNIQUES USING C

	L	T	P	C	M
	1	0	2	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the various technologies used to solve the problem.

- Learn the fundamentals of algorithm design.

- Understand the basics of C Programming.

- learn the single and multi dimensional arrays, C Functions and Structures.

- learn the pointer and its usages in programming

UNIT I - INTRODUCTION TO COMPUTER PROBLEM SOLVING   **7**

Introduction – The Problem Solving aspect – Top down / Bottom up Design - Exchanging the values – Counting – Summation of a set of numbers – Factorial Computation – Generation of the Fibonacci Series – Reversing the digits of an integer - SINE computation – Base Conversion – Factoring Methods – Array Techniques.

UNIT II - INTRODUCTION TO C LANGUAGE   **7**

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input/Output Operations – Formatted I/O – Decision Making - Branching – IF, Nested IF – Switch – goto - Looping- While, do, for statements.

UNIT III – ARRAYS, FUNCTIONS, STRUCTURES AND UNIONS   **8**

Arrays – dynamic and multi-dimensional arrays - Character arrays and Strings – String handling Functions - User defined Functions – Categories of Functions – Recursion - Structures and Unions – Array of Structures – Structures and Functions.

UNIT IV – POINTERS AND FILE MANAGEMENT   **8**

Pointers – Declaration, Accessing a variable, character strings, pointers to functions and structures - File Management in C – Dynamic Memory allocation – Linked Lists – Preprocessors.

List of Experiments:

1. Write programs to implement input and output statement.

2. Write programs to implement Conditional and Unconditional Statements.

3. Write programs to implement matrix operations using multidimensional array

4. Write programs to display all prime numbers between two intervals using functions

5. Write a program to display the given sentence in reverse order.

6. Write programs to implement Control Statements

7. Write a program to display 'n' numbers in sorting order using pointers.

8. Write a program to implement dynamic memory allocation.
9. Write a program to read the data and determine the following:
   a. Total marks obtained by each subject
   b. Finding Highest Mark each subject and who secured the highest mark.

*Laboratory Integrated Theory Course   **TOTAL = 45 Hours**

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Solve the basic problem and write simple programs using C.
- Build basic programs using Arrays, functions.
- Develop Simple programs using Structures and Union.
- Develop programs using C pointers.
- Develop Programs using File Pointers.

REFERENCES:

1. R.G.Dromey, "How to Solve it by Computer", Pearson Education , India. 2007.
2. Seymour Lipschutz, " Essentials Computer Mathematics", Schaums' Outline Series
3. PradipDey, ManasGhosh, "Programming in C", First Edition,OxfordUniversity Press, 2011.
4. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language" (2nd Edition), 1988, Prentice Hall.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India) Pvt. Ltd., Pearson Education in South Asia, 2011
6. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA101.1	Solve the basic problem and write simple programs using C.	3	3	3	2	3	3	3	2	2	3	1	3	1	3	3
P20MCA101.2	Build basic programs using Arrays, functions.	3	3	3	2	3	3	3	2	2	3	1	3	1	3	3
P20MCA101.3	Develop simple programs using structures and Union	3	3	3	2	3	3	3	2	1	3	1	3	1	3	3
P20MCA101.4	Develop programs using C pointers	3	3	3	2	3	3	3	2	1	3	1	3	1	3	3
P20MCA101.5	Develop Programs using File Pointers	3	3	3	2	3	3	3	2	1	3	1	3	1	3	3

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P20MCA102 - COMPUTER ORGANIZATION AND ARCHITECTURE

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:
This course will enable the student to:
- Become familiar with Number system.
- Understand the basic operations of CPU.
- Learn the concepts of processor design
- Become familiar with the memory hierarchy design.
- Understand the concepts of Parallel Processing

UNIT I - INTRODUCTION   9

Introduction to Computer Organization, I/O Storage Devices, CPU Processor, Data Representation, Number System, Computer Arithmetic and Boolean Algebra, Generations of Computer, Introduction to Operating Systems, and system Software – Logic gates – Flip Flops – R – S, J & K, and T Flip Flops, Counters, Registers.

UNIT II - BASIC STRUCTURE OF COMPUTER   9

Functional Units - Basic Operational Concepts – Bus structures – Performance and Metrics – instruction and instruction sequencing – Hardware Software Interface – Addressing modes – Instruction Sets – RISC and CISC – ALU Design – Fixed point and Floating point operations

UNIT III – PROCESSOR DESIGN   9

Processor basics –CPU Organization – Data Path Design – Control Design – Basic concepts – Hardwired control – Micro Programmed control – Pipe control – Hazards super scale operations

UNIT IV – MEMORY HIERARCHY   9

Cache memory organization, Cache addressing modes, direct mapping and associative caches, Elements of cache design, Techniques to reduce cache misses via parrallelism, techniques to reduce cache penalties, technique to reduce cache hit time, Shared memory organization, Interleaved memory organization, bandwidth and fault tolerance, Sequential and weak consistency model - Flash memory.

UNIT V - SIMD ARCHITECTURE   9

Introduction, Parallel Processing, classification of Parallel Processing, Fine-Grained SIMD Architecture, coarse-Grained SIMD Architecture - Basic Features of Current Architectural Trends. DSP Processor, Dual core Technology.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Simplify and solve the problems in number systems
- Design the combinational and sequential circuits.
- Describe various processing design.
- Differentiate various mapping policies of cache memory
- Discuss the various parallel processors.

REFERENCES

1. M. Morris Mano,"Computer System Architecture", 3rd Edition, Prentice Hall of India, 2014.

2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer organization and Embedded Systems", 6th Edition, Tata McGraw Hill, 2012.

3. William Stallings, "Computer Organization & Architecture – Designing for Performance" 9th Edition, Prentice Hall of India 2012

4. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", 5th Edition, Morgan Kaufmann, Elsevier, 2014.

5. David Harris and Sarah Harris "Digital Design and Computer Architecture", 2nd Edition Morgan Kaufmann, 2012.

6. Svetlana N. Yanushkevich, Vlad P. Shmerko, "Introduction to Logic Design", CRC Press, 2012.

CO No	Course Outcome (CO)	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	PSOa	PSOb
P20MCA102.1	Simplify and Solve the problems in number systems	3	3	3	2	2	3	3	1	2	3	1	3	1	3	3
P20MCA102.2	Design the combinational and sequential circuits	3	3	3	2	2	3	3	1	2	3	1	3	1	3	3

P20MCA102.3	Describe various processing design	3	3	3	2	2	3	3	1	1	3	1	3	1	3	3
P20MCA102.4	Differentiate various mapping policies of cache memory	3	3	3	2	2	3	3	1	1	3	1	3	1	3	3
P20MCA102.5	Discuss the various parallel processors	3	3	3	2	2	3	3	1	1	3	1	3	1	3	3

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P20MCA103 - PYTHON PROGRAMMING

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Explain the basic concepts of Python programming
- Describe the logics of control flow statements
- Discuss the data structure concepts with the help of sequence
- Illustrate file handling functions
- Write python applications using MySQL.

UNIT I - INTRODUCTION   9

OOPS Concepts: Programming Paradigm- Procedure Oriented Programming - Object Oriented Programming - Concepts of OOP - Features of Python- History of Python – The Future of Python – Python Interpreter and Interactive Mode – Writing and Executing First Python Program – Value and Types – Numbers-Boolean – Lists – Strings – Variables and Identifiers – Data Types –Statements – Reserved Words-Tuple Statement – Dictionary-Operators and Expressions – Expression in Python – Operations on Strings – Type Conversion – Comments – Function and Modules

UNIT II - CONTROL FLOW AND FUNCTIONS   9

Introduction to Decision Control Statements – Selection/Conditional Branching Statements – Basic Loop Structures/Iterative Statements - Nested Loops – The break Statement – The continue Statement – The pass Statement – The else Statement Used with Loops– Functions : Defining a Function–Function Call - Variable Scope and Lifetime – Fruitful Functions – Lambda Functions or Anonymous Functions – Function Composition in Python – Documentation Strings – Good Programming Practices - Recursive Functions – Function Redefinition.

UNIT III –SEQUENCE   10

String: Concatenating, Appending, and Multiplying Strings – Strings are Immutable – String Formatting Operator – Built-in-String Methods and Functions – Slice Operation –ord() and chr() Functions – in and not in Operators - Comparing Strings – Iterating String – The String Module-Metacharacters in Regular Expression - Sequence-Lists – Tuple – Dictionaries.

UNIT IV - FILE HANDLING   8

Introduction – File Path – Types of Files – Opening and Closing Files – Reading and Writing Files- File Positions - % Sting Formatting Operator - Command Line Arguments – Renaming and Deleting Files –Directory Methods.

UNIT V - PYTHON MODULES AND PACKAGES   9

Introduction to Errors and Exceptions – Handling Exceptions - Multiple Except Blocks– Multiple Exceptions in a Single Block – Except Block Without Exception – The else cause – Raising Exceptions – Handling Exceptions in Invoked Functions – Built – in and User Defined Exceptions- The try…finally Block – Pre-defined Clean – up Action – Modules – Packages in Python – Standard Library Modules - SQL Introduction – Simple Queries – Create - Insert – update – delete - MySQL Introduction – connecting python and MySQL database.

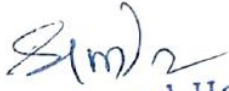**TOTAL = 45 Hours**

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Write simple applications
- Develop programs using loops
- Create applications using functions
- Develop application using files
- Create application using Python and MySQL

REFERENCES

1. ReemaThareja, "Problem Solving and Programming with Python ", Second Edition, Oxford University Press2019. (Unit I – V).

2. Swaroop C N, "A Byte of Python ", ebshelf Inc., 1st Edition, 2013.

3. Wesley J. Chun, "Core Python Programming", Pearson, 2nd Edition, 2006.

4. Allen B.Downey, "Think Python: How to Think Like a Computer Scientist", O'Reilly Media, 2ndEdition, 2015.

5. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	P3O a	P3O b
P20MCA103.1	Write Simple application programs in Python programming.	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3
P20MCA103.2	Develop program to implement control statements and functions	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3
P20MCA103.3	Create applications using string functions sequences and dictionaries	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3
P20MCA103.4	Develop applications to implement file handling functions in Python	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3
P20MCA103.5	Create Python modules and packages to facilitate modular programming	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3

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P20MCA104 - DATA STRUCTURES AND ALGORITHMS

L	**T**	**P**	**C**	**M**
3	1	0	4	100

COURSE OBJECTIVES:

This course will enable the student to:

- Acquire knowledge of Linear Data Structures and its applications
- Understand the concepts of Non-Linear Data Structures
- Apply the algorithm techniques to solve the real-time problems.
- Analyse the algorithms on various algorithm design techniques.
- Understand the concepts of NP and NP-Hard problems.

UNIT I   LINEAR DATA STRUCTURE   12

Arrays, Records, lists – linear list , linked lists, doubly linked lists and circular linked lists – stack– implementation – application - queue – implementation – application , priority queue-Deque - Hashing.

UNIT II   NON – LINEAR DATA STRUCTURE   12

Trees . binary tree representation – binary search tree – operations- AVL trees -B- trees – Red black tree - graph: Representation of graphs- Net work flow problems – graph Traversals

UNIT III   DIVIDE AND CONQUER AND GREEDY METHOD   12

Analyzing and Designing algorithms – Asymptotic notation – Algorithms design techniques-Divide and conquer - Quick Sort – Merge sort. Greedy method – Knapsack problem – algorithm for Huffman codes-– Minimum –cost spanning trees – Single source shortest paths problem

UNIT IV   DYNAMIC PROGRAMMING AND BACKTRACKING   12

Dynamic programming – Matrix chain multiplication - Floyd-Warshall algorithm – Optimal binary search tree – Memory functions. Backtracking – N-Queens problem – Hamiltonian circuit problem

UNIT V   BRANCH AND BOUND   12

Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem. NP-hard and NP-complete problems – Definitions and Properties –Clique decision problem – Node cover problem – Travelling salesman decision problem.

TOTAL = 60 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Design an efficient algorithms based on storage and execution time.
- Depict the non-linear data structures in the real-time applications.
- Analyse the space and time complexity of the algorithms.
- Apply algorithm design techniques in designing the algorithms.
- Apply the heuristic algorithms to the real-time problems.

REFERENCES

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson,2020.
2. Michael T. Goodrich , Roberto Tamassia , Michael H. Goldwasser, "Data Structu Algorithms in Python", Wiley; First edition, 2013.
3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms" Addison Wes Edition, 2012
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to algorithm 3rd Edition, 2010.
5. VijayalakshmiPai G.A, "Data Structures and Algorithms: Concepts Techniques and Applications", Mc Graw Hill, 2009.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	P3O a	P3O b
P20MCA103.1	Design an efficient algorithms based on storage and execution time	3	3	3	3	3	3	3	2	2	3	1	3	2	3	3
P20MCA103.2	Depict the non-linear data structures in the real-time applications	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA103.3	Analyse the space and time complexity of the algorithms	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA103.4	Apply algorithm design techniques in designing the algorithms	3	3	3	3	3	3	3	2	1	3	2	3	2	3	3
P20MCA103.5	Apply the heuristic algorithms to the real-time problems	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3

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P20MCA105-RELATIONAL DATABASE MANAGEMENT SYSTEMS

	L	T	P	C	M
	2	0	2	3	100

OBJECTIVES:

This course will enable the student to:

- Understand the basis of relational databases and learn how to retrieve and manipulate data from one or more tables.
- Manipulate data with subqueries and aggregate functions.
- Apply views and joins to manage database.
- Demonstrate stored procedures and triggers.
- Work with various databases and create reports.

UNIT I – DESIGNING AND CONSTRUCTING A DATABASE   9

Database design: Database structure, Design process, Pre-design phase of design, Organizing your data, Functional dependency and candidate keys, Entity-relational modeling, Normalization. Creating databases: Creating a database, choosing which database to access, creating a table, Relational data types, Specifying keys, Column constraints, Default values, Design of the movie info database, Indexes. Creating, changing, and removing records: Preparing data, INSERT statement, SELECT and INSERT together, DELETE statement, UPDATE statement, TRUNCATE statement, DROP statement, ALTER statement.

UNIT II - RETRIEVING DATA FROM A DATABASE   9

SELECT statement: Anatomy of a SELECT statement, specifying columns to retrieve, performing calculations on selected data, Using AS to name columns and expressions, Filtering query results using the WHERE clause, dealing with null values, Sorting query results, How the equality of string is determined. Using WHERE Clause: Using logical operators in the WHERE clause, the IN clause, The BETWEEN Clause, Matching parts of strings using LIKE, Useful functions for WHERE clauses. Aggregating query results: Selecting unique values using DISTINCT, Aggregate functions, COUNT() function, SUM() and AVG() function, Dividing aggregates into categories, Filtering query results using HAVING. Combining Tables using Joins: Joins and Normalization, what is a Join, Using Joins, Types of joins, Joining More than two tables, Outer Joins, UNION Joins, SQL -92 Join Syntax. Subqueries: What is a subquery, Types of subqueries, Subqueries that return a list of values, Subqueries that return a single value, writing complex queries, Using subqueries in UPDATE and DELETE statement, Using subqueries with INSERT.

UNIT III – DATABASE MANAGEMENT   9

Using Views: Creating Views, Advantages of Using Views, Creating Column Aliases, Single - Table Views, Views that Use Joins, Creating Views with Subqueries, Using Other Join Operations in views, Nesting Views, Updating Views, tasks you can accomplish with views. The SQL Security Model: Overview of Database Security, Creating Database Users, Database elements, Using GRANT and REVOKE, Security Roles, Views and Database Security. Real-World Issues Handling Specific Types of Data: Numeric Data Types, String Data Types, dealing with Dates, Converting Data Between Types. Database Performance and Integrity: Improving Database Performance, Performance Measurement Tools, Indexes, The Query Optimizer, Data Integrity, Integrity Versus Performance. Transactions and Cursors: Transactions, Using Transactions in Oracle, Using Transact – SQL, Using Cursors in Oracle PL/SQL.

UNIT IV – STORED PROCEDURES 9

Writing Stored Procedures: Writing a Stored Procedure, working with Variables, Defining Blocks of Code, Conditional Statements Using IF, using Loops, Loop over a Cursor, Triggers. More on Transact – SQL Stored Procedures: General Transact-SQL Programming Information, Global Variables, Using RETURN to Leave Stored Procedures, Handling Errors, Using Temporary Objects, WAITFOR, Advanced Trigger-Writing Techniques. Writing Oracle PL/SQL stored procedures: The Declaration Section, The Executable Section, Exception Handling, Writing Stored Procedures, Creating and Using Custom Functions, Bundling Procedures and Functions in Packages, Debugging PL/SQL Queries, Triggers.

UNIT V – SPECIFIC DATABASES 9

Oracle: SQL*PLUS, Creating Reports in SQL*PLUS, Oracle System Views, Sequences, Synonyms, Oracle Data Types, Oracle Resources on the Web Microsoft Access: Microsoft Database Files, ODBC, The Access Interface, Objects in Microsoft Access Resources MySQL: Obtaining MySQL and MySQL, Contrasting MySQL and MySQL, Using MySQL, MySQL Features, MySQL Limitations, MySQL Data Types, MySQL, String Comparisons in MySQL and MySQL.

LIST OF EXPERIMENTS

1. Consider the following Order Table: SALESMAN (Salesman_id, Name, City, Commission, Customer_name, Customer_City, Purchase_amt, Purchase_date)

    Perform the following DDL commands in SQL:
    i.   Creating a database
    ii.   Viewing all tables in a database
    iii. Creating tables (with and without constraints)
    iv.   Altering tables (with ADD/MODIFY keywords)
    v.   Dropping a table/database
    vi.   Truncating a table/database
    vii. Renaming a table/database

2. Consider the following College database:
    STUDENT (Stud_id, Name, Age, Address, Phone_no, Email_ID);
     SEMESTER (Stud_id, Sem_id, Degree, Year_of_Adm)
    SUBJECT (Stud_id, Subject_code, Sub_title,Semester,Credits)
    Perform the following DCL and TCL commands in SQL:
    i.   Commit
    ii.   Rollback
    iii. Save Point
    iv.   Grant
    v.   Revoke

3. Consider the following Book Table:
    BOOK (Book_id, Title, Author_Name, Publisher_Name, Pub_Year, No_of_Copies)
    Perform the following DML commands in SQL:

    i.   Inserting records
    ii.   Updating the existing records
    iii. Deleting the specific records
    iv.   Selecting records from the existing table

Department of MCA   Regulation - 2020   SEMESTER - I

4. For a given set of relational database, create tables and perform the following SQL queries:
   SALESMAN (Salesman_id, Name, City, Commission)
   CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
   ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
   i.   Simple Queries with Select - Where – Between – Like – Distinct clauses.
   ii. Simple Queries with Aggregate functions
   iii. Queries with group by and having clause
   iv. Queries involving - Date Functions, String Functions, Math Functions
   v.   Sort records with Order by clause.

5. For a given set of relational database for Movie information, create tables and perform the following SQL queries:
   ACTOR (Act_id, Act_Name, Act_Gender)
   DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
   MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Act_id, Dir_id)
   MOVIE_CAST (Act_id, Actor_name, Mov_id, Role)
   RATING (Mov_id, Rev_Stars).

   i.   Subqueries- With ANY, SOME and ALL clauses.
   ii. Join Queries- Inner Join, Outer Join, Left Join, Right Join, Self-Join Subqueries- With IN and NOT IN clause, With EXISTS and NOT EXISTS clause.
   iii. Create a simple view that shows all movie records of a particular director.
   iv. Create a complex view that shows all movie records of a particular film with highest rating and actor name.
   v.   Update/Drop the existing views.

1. Create a PL/SQL Cursor to generate student grade calculation.
2. Consider the following Bank table:
   Bank (cid, cname, add, accno, acctype, bankname, dep_amt, bal_amt).
   i.   Write a PL/SQL procedure which accept the account number of a customer and retrieve the balance.
   ii. Write a PL/SQL updated trigger on Bank table. The system should keep track of the records that are being updated.

Total = 60 Hours

COURSE OUTCOMES

At the end of the course the student should be able to:

• Illustrate database design.
• Execute various DDL and DML queries.
• Retrieve data using subqueries and combine tables using Joins.
• Executive SQL queries related to data control language to enforce security in a m user database environment.
• Create simple and advanced PL/SQL code blocks for stored procedures, cursors triggers.

REFERENCES:
1. Steve Tale, "SQL: The Ultimate Beginners Guide: Learn SQL Today", Crete Space Independent Publishing Platform, 2016.
2. Special Edition Using SQL, Rafe Colburn, Paperback, 1st edition 1999.

3. Alvin K White, "SQL: QuickSort Guide – The Simplified Beginner's Guide To SQL", Clydebank Technology, EPUB, 2015.
4. "Learning SQL", By Alan Beaulieu, O'Reilly Media, 2014.
5. Ben Forta, "Sams Teach Yourself in 10 Minutes", SAMS, 4th edition, 2012
6. Special Edition Using SQL, Rafe Colburn, Paperback, 1st edition, 1999.

CO No	Coursse Outcome(CO) On completion of the course the Student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA105.1	Illu3trate database design	3	2	3	3	2	2	2	2	1	2	3	3	2	3	2
P20MCA105.2	Execute various DDL and DML queries	3	3	3	3	3	2	2	2	1	3	3	3	2	3	2
P20MCA105.3	Retrieve data using subqueries and combine table3 using Joins	3	2	3	3	3	2	2	2	2	2	3	3	2	3	2
P20MCA105.4	Executive 3QL queries related to data control language to enforce security in a multi-user database environment.	3	2	3	3	2	2	2	2	1	2	3	3	2	3	2
P20MCA105.5	Create simple and advanced PL/SQL code blocks for stored procedures, cursors and triggers.	3	2	3	3	3	3	2	2	2	2	3	3	2	3	2

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Department of MCA   Regulation - 2020   SEMESTER - I

P20MCA106 – MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

L	T	P	C	M
3	1	0	4	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the basis of Propositional Logic and Theory of Inference
- Understand and apply the Grammars of the formal languages.
- Construct the Finite and Nonfinite Automata theory.
- Understand the concepts of graph and its algorithms.
- Understand and Illustrate the methods of handling quantitative and qualitative data

UNIT I – PROPOSITIONAL LOGIC 12

Propositions – Logical connectives – Negation – Disjunction – Conjunction – Conditional – bi conditional – Tautologies and contradictions - Equivalence and Implications – Duality law – Dual statements – Exclusive OR – NOR – NAND – Normal forms – Theory of Inference and deduction. Predicate calculus: Predicates and quantifiers, Mathematical induction.

UNIT II – FORMAL LANGUAGES 12

Languages and grammars - Phrase structure grammar - Classification of grammars -Pumping lemma for regular languages - Context free languages.

UNIT III – FINITE STATE AUTOMATA 12

Finite state automata - Deterministic finite state automata (DFA) – Non-deterministic finite state automata (NFA) - Conversion of NFA to DFA, Optimizing DFA, FA with output: Moore machine, Mealy machine, conversions.

UNIT IV –STATISTICS 12

Statistical Investigation – Sampling - Methods of Sampling- Sampling Survey- Data – Collection of Data – Classification and tabulation of Data – Diagrammatic and graphical presentation of data- Construction of frequency distribution – Nominal , Ordinal and Ratio.

UNIT V – PROBABILITY 12

Probability – Types of Probability – Axiomatic approach to Probability – Theorems of Probability- Bayes Theorem- Random Variable – Distribution Function – Joint, Marginal and Conditional Distribution function.

TOTAL = 60 Hours
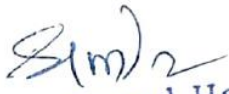
COURSE OUTCOMES:

At the end of the course the student should be able to:

- Illustrate the problems on propositional logic
- Design the grammars of the programming languages
- Construct the finite automata of the regular expression
- Apply and acquire knowledge on graph algorithms in the real time applications.
- Acquire the basic statistics knowledge of Graph theory and functionalities.

REFERENCES

1. J.P. Trembley and R. Manohar "Discrete Mathematical structures with Applications to Computer science" McGraw Hill Pvt. Ltd, New Delhi.
2. KantiSwarup, P.K. Gupta and Man Mohan, "Operation Research", Sultan Chand & Sons, Sixteenth Edition, 2012.
3. Taha H.A., "Operations Research: An Introduction", Pearson Education, 7th Edition, 2004.
4. B L Agarwal, Basic Statistics, New Age International, 6th Edition, 2013
5. B.L. Agarwal, Programmed Statistics, New Age International, 2017
6. T. Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw Hill Pvt. Ltd., New Delhi, 5th Reprint (2008) (Unit-V: Pages 448-490).
7. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	P3O a	P3O b
P20MCA106.1	Illustrate the problems on propositional logic	3	3	3	3	3	3	3	2	3	3	2	3	2	3	3
P20MCA106.2	Design the grammars of the programming languages	3	3	3	3	3	3	3	2	3	3	2	3	2	3	3
P20MCA106.3	Construct the finite automata of the regular expression	3	3	3	3	3	3	3	2	3	3	2	3	2	3	3
P20MCA106.4	Apply and acquire knowledge on graph algorithms in the real time applications	3	3	3	3	3	3	3	2	3	3	2	3	2	3	3
P20MCA106.5	Acquire the basic statistics knowledge of Graph theory and functionalities	3	3	3	3	3	3	3	2	3	3	2	3	2	3	3

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L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

1. Learn to develop python applications for real world problems.
2. Gain a working knowledge of python programming and learn how to apply data structure concepts in python.
3. Acquire a working knowledge of creating applications using python modules
4. Learn to write programs using file handling functions.
5. Configure and develop python applications using MySQL.

LIST OF EXPERIMENTS

1. Develop programs to learn operators using python.

2. Develop programs to learn string operations and string formatting in python.

3. Develop programs to understand the control structures of python.

4. Develop programs to learn concept of functions scoping and recursion.

5. Develop programs to learn different types of structures (list, dictionary, and tuples) in python.

6. Develop programs for data structure algorithms using python – searching and sorting.

7. Develop programs to implement built-in-string methods and functions.

8. Develop programs to read and write a text file.

9. Develop programs using Python Module.

10. Develop python application using MySQL Database.

TOTAL = 60 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Develop python applications for real world problems.
- Create applications using files
- Develop applications using MySQL

CO No	Course Outcome(CO) On completion of the course the student should be able to:	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	P3O a	P3O b
P20MCA107.1	Develop python applications for real world problems	3	2	3	3	2	2	2	2	1	2	3	3	2	3	2
P20MCA107.2	Create applications using files	3	2	3	3	3	2	2	2	2	2	3	3	2	3	2
P20MCA107.3	Develop applications using MySQL	3	2	3	3	3	2	2	2	2	2	3	3	2	3	2

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L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Demonstrate the experiments on Linear and Non Linear Data Structures.

- Understand the implementation of various algorithmic techniques

- Gain knowledge on designing the algorithm for the real time problem

- Understand the significance of the algorithms in the real time problems.

- Understand the implementation of approximate algorithm

LIST OF EXPERIMENTS

1. Write a program to perform the operations of Stack and Queue.

2. Write a program to implement the polynomial expression addition and multiplication using Linked List.

3. Write a program to perform Graph Traversals

4. Apply divide and conquer method to sorting the given numbers using Quick sort and Merge Sort.

5. Apply Greedy Method to find the Minimum Spanning Tree.

6. Write a program to implement the single source shortest path problem using Greedy Method.

7. Apply the Dynamic Programming to apply Floyd's and Warshal Algorithm.

8. Write a program to implement 8 Queens' Problem using Backtracking Algorithm.

9. Apply Branch and Bound to find solution for 0 / 1 Knapsack Problem.

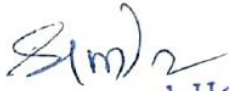10. Apply NP Complete to find solution for Travelling Salesman Problem.

TOTAL = 60 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Demonstrate the experiments on Linear and Non-Linear data structures.
- Design an algorithm for the real time problem
- Demonstrate the application using the algorithm techniques.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA108.1	Demonstrate the experiments on Linear and Non Linear data structures	3	3	3	3	3	3	3	2	2	3	1	3	2	3	3
P20MCA108.2	Design an algorithm for the real time problem	3	3	3	3	3	3	3	2	2	3	1	3	2	3	3
P20MCA108.3	Demonstrate the application using the algorithm techniques	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3

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COURSE OUTCOMES:

At the end of the course the student will be able to:

1. Demonstrate capabilities in additional soft-skill areas using hands-on and/or case-study approaches
2. Solve fundamental problems in specific areas of Quantitative aptitude & Logical Reasoning
3. Demonstrate higher level of verbal aptitude skills in English with regard to specific topics
4. Read and interpret timetables, graphs, etc. and also introduce themselves in a formal situation

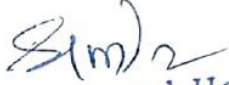|	
1. Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. SWOT Analysis b. Goal Setting c. Attitude Building d. Innovation and Creativity e. Problem Solving and Decision Making f. Dealing with Criticism
2. Quantitative Aptitude and Logical Reasoning	**Solving simple problems with reference to the following topics:** a. Vedic Maths b. Number properties c. Ratio & Proportion d. Mixtures & Solutions e. Problems on ages f. Averages g. Clocks h. Calendars i. Direction Sense j. Coding and Decoding k. Blood Relation l. Data Arrangement
3.Focus on language	**Demonstrating plain English language skills with reference to the following topics:** a. Synonyms b. Antonyms c. Tenses d. Prefixes and suffixes e. Collocations f. Phrasal verb g. Verbal analogy h. Sentence filler words i. Jumbled sentences j. Reconstructions of sentences (PQRS) k. Sentence fillers two words
4. Reading	Reading comprehension, understanding notices, messages, timetables, etc. reading passages for specific information transfer
5. Writing	Report writing and proposal writing
6. Speaking	Self-introduction, personal information, name, home background, study details, area of interest, hobbies, strengths and weaknesses, projects and paper presentations, likes and dislikes in food, travel, clothes, special features of home town and introduction to articulation skills

TOTAL = 30 Hours

CO / PO, PSO Mapping (3/2/1 indicate3 3trength of correlation) 3-3trong, 2-Medium, 1-Weak													
Programme													
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO – 1	1	1	2	1	1	3	3	3	1	1	2	1	3
CO – 2	1	1	1	1	1	3	3	2	1	1	1	3	2
CO – 3	1	1	1	1	1	3	3	3	1	3	2	1	3
CO – 4	1	1	1	1	1	3	3	3	1	2	2	1	2

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MCA II-Sem

Courses of Study for MCA II Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA201	Operating Systems	2	0	0	2	30
2	P20MCA202	Computer Networks	2	0	0	2	30
3	P20MCA203	Internet Programming	3	0	0	3	45
4	P20MCA204	Cloud Computing Technologies	3	0	0	3	45
5	P20MCA205	Data Science*	3	0	2	4	75
6	P20MCA206	Mobile Application Development	3	0	0	3	45
7	noc23-cs46	NPTEL Course: Object Oriented System Development using UML, Java And Patterns	3	0	0	3	45
	noc23-cs50	NPTEL Course: Programming in Modern C++					
		Practical					
8	P20MCA 207	Internet Programming Laboratory	0	0	4	2	60
9	P20MCA208	Cloud Computing Technologies Laboratory	0	0	4	2	60
10	P20MCA209	Soft Skills and Aptitude Career Enhancement Laboratory - II	0	0	2	1	30
*Laboratory Integrated Theory				Total Credits		25	

Approved by

Chairperson, MCA BOS
Dr.T.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar 1/3/23

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-

HOD MCA, Second Semester MCA Students and Staff, COE

22.02.2023

Regulations-2020

P20MCA201 - OPERATING SYSTEMS

	L	T	P	C	M
	2	0	0	2	100

COURSE OBJECTIVES:

This course will enable the student to:
- Describe the basic organization of computer systems.
- Understand inter process communication using shared memory and message passing.
- Gain knowledge about CPU scheduling and the basis for multi programmed operating systems.
- Provide a detailed description of various ways of organizing memory hardware.
- Know the performance and characteristics of mass-storage devices.

UNIT I - INTRODUCTION & SYSTEM STRUCTURES   **5**

What Operating Systems Do - Computer System Organization- Computer System Architecture: Operating System Services- System Calls - Types of System Calls - System Programs – Operating System Structure - System Boot.

UNIT II – PROCESS MANAGEMENT   **5**

Process Concept- Process Scheduling- Operations on Processes- Inter process Communication- Multicore Programming- Multithreading Models- Implicit Threading- Threading Issues- The Critical Section Problem- Semaphores- Classic Problems of Synchronization.

UNIT III – CPU SCHEDULING & DEADLOCKS   **5**

CPU Scheduling: Basic Concepts - Scheduling Criteria- Scheduling Algorithms - Thread Scheduling- Multiple Processor Scheduling - Real-Time CPU Scheduling. Deadlocks: System Model- Deadlock Characterization- Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance- Deadlock Detection - Recovery from Deadlock.

UNIT IV – MEMORY MANAGEMENT   **5**

Main Memory: Background- Swapping- Contiguous Memory Allocation Segmentation- Paging. Virtual memory : Background- Demand Paging- Copy-on Write- Page Replacement- Allocation of Frames- Thrashing.

UNIT V – STORAGE MANAGEMENT   **5**

Mass-Storage Structure: Overview of Mass Storage Structure- Disk Structure- Disk Attachment- Disk Scheduling- Disk Management- Swap-Space Management- RAID Structure. File System Interface: File Concept- Access Methods- Directory and Disk Structure- File System Mounting- File Sharing- Protection. File System Implementation: File

System Structure- File System Implementation- Directory Implementation- Allocation Methods – Free Space Management- Efficiency and Performance- Recovery.

TOTAL = 30 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Explain the fundamental concepts of operating system services and system calls

- Analyze the issues and use of locks, semaphores and monitors for synchronizing multithreaded systems and implement them in multithreaded programs.

- Describe the concepts of deadlock in operating systems and how they can be managed / avoided.

- Implement memory management techniques.

- Apply the algorithms in secondary storage and file management techniques

REFERENCES

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

2. G. Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts & Design", Fifth edition, Addison-Wesley, 2012.

3. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, 7thEdition, 2011.

4. Andrew S. Tanenbaum& Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice-Hall, Second Edition, 2006.

5. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 1st Edition, 2001.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	P O A	P O B	P O C	P O D	P O E	P O F	P O G	P O H	P O I	P O J	P O K
P20MCA201.1	Describe the basic organization of computer systems.	3	3	3	3	3	3	2	2	2	2	3
P20MCA201.2	Understand inter process communication using shared memory and message passing.	3	3	3	3	3	2	2	2	2	2	3
P20MCA201.3	Gain knowledge about CPU scheduling and the basis for multi programmed operating systems.	3	3	3	3	3	3	2	2	2	3	3
P20MCA201.4	Provide a detailed description of various ways of organizing memory hardware.	3	3	3	2	3	3	2	3	2`	3	3
P20MCA201.5	Know the performance and characteristics of mass-storage devices.	3	3	3	3	3	3	2	3	2	3	3

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P20MCA202 – COMPUTER NETWORKS

L	T	P	C	M
2	0	0	2	100

COURSE OBJECTIVES:
This course will enable the student to:

- Understand the protocol layering and physical level communication.
- Analyze the performance of a network.
- Understand the various components required to build different networks.
- Learn the functions of network layer and the various routing protocols.
- Familiarize the functions and protocols of the Transport layer.

UNIT I - INTRODUCTION AND PHYSICAL LAYER   **5**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II – DATA-LINK LAYER & MEDIA ACCESS   **5**

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III - NETWORK LAYER   5

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV – TRANSPORT LAYER   **5**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V – APPLICATION LAYER   **5**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP

TOTAL = 30 Hours

COURSE OUTCOMES:
At the end of the course the student should be able to:

- Understand the basic layers and its functions in computer networks.
- Evaluate the performance of a network.
- Understand the basics of how data flows from one node to another.
- Analyze and design routing algorithms.
- Design protocols for various functions in the network.
- Understand the working of various application layer protocols

REFERENCES

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

3. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.

4. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.

5. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

6. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA202.1	Understand the protocol layering and physical level communication.	3	2	2	2	1	1	1	1	2	1	1	2	1	3	3
P20MCA202.2	Analyze the performance of a network.	3	3	3	2	1	1	1	1	2	1	1	1	1	3	3
P20MCA202.3	Understand the various components required to build different networks.	3	3	3	1	2	1	1	2	2	2	1	1	1	3	3
P20MCA202.4	Learn the functions of network layer and the various routing protocols.	3	3	3	3	2	2	2	2	2	2	3	2	1	3	3
P20MCA202.5	Familiarize the functions and protocols of the Transport layer.	3	3	3	2	3	2	2	2	2	2	3	2	1	3	3

P20MCA203 - INTERNET PROGRAMMING

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:
- Understand the various technologies used over internet.
- Learn java-specific web services architecture.
- Discuss on Client and Server side scripting
- Learn the Spring framework and build applications using Spring.
- Learn and implement the concept of Java Persistence API

UNIT I - WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II – CLIENT SIDE PROGRAMMING 9

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL. AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods

UNIT III - SERVER SIDE PROGRAMMING 9

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server-DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV – SPRING 9

Spring Configuration and Spring Boot, Spring MVC: Dispatcher Servlet and Configuration - Interceptors - Controllers - Views - Input Validation - File Upload, Building RESTful Web Services, Spring Security Architecture, Spring Cache.

UNIT V – JAVA PERSISTENCE API AND HIBERNATE 9

Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Construct a basic website using HTML and Cascading Style Sheets.
- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.
- Develop server side programs using Servlets and JSP.
- Implement Web Application using Spring
- Implement a Java application using Java Persistence API.

REFERENCES:

1.   Deitel and Deitel and Nieto,"Internet and World Wide Web - How to Program", Prentice Hall, 5th Edition, 2011.

2.   Stephen Wynkoop and John Burke,"Running a Perfect Website",QUE,2nd Edition,1999.

3.   Chris Bates, "Web Programming – Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.

4.   Jeffrey C and Jackson,"Web Technologies A Computer Science Perspective", Pearson Education, 2011.

5.   Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.

6.   UttamK.Roy, -"Web Technologies", Oxford University Press, 2011.

CO No	Course Outcomes - On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA203.1	Construct a basic website using HTML and cascading style sheets.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA203.2	Build dynamic web page with validation using java script objects and by applying different event handling mechanism.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA203.3	Develop server side programs using servlet and JSP.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA203.4	Implement web applications using spring	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA203.5	Implement a java application using Java persistence API	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3

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P20MCA204 - CLOUD COMPUTING TECHNOLOGIES

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand Cloud computing its services.
- Understand the virtualization techniques in cloud.
- Explain the concept of cloud database and analyze the various security concerns of cloud.
- Discuss on the storage and testing in cloud
- Discuss on the Real time applications and Best practices of cloud.

UNIT I - OVERVIEW OF CLOUD COMPUTING 9

Introduction to Cloud Computing –Cloud service models – Cloud computing sub service models – Cloud deployment models – Alternative deployment models – Cloud architecture – Characteristics of cloud computing.

UNIT II – VIRTUALIZATION AND LOAD BALANCING IN CLOUD 9

Virtualization Techniques – Virtualization Technology – Overview of x86 virtualization - Types of Virtualization – CPU – Memory – Device and I/O – OS level – Network Server–Client-Application – Open source Containers in Cloud Kubernetes- Load balancing.

UNIT III – DATABASE AND SECURITY 9

Cloud databases and File systems –Cloud database , Cloud File system , Cloud Programming model – Cloud Disaster Recovery - Security concerns of cloud computing – Cloud information security objectives - Cloud security and existing security solutions –Cloud Security Architecture, VM Security challenges , Vulnerability Assessment tools for cloud , Open source security solution products in cloud .

UNIT IV – CLOUD STORAGE AND CLOUD TESTING 9

Cloud Middleware – Concept and Need of Cloud Middleware. Cloud optimized storage: scalability – Replications options – Data archiving methods – Physical storage facilities: Data center operations – Data monitoring strategies - Cloud testing – Secure cloud software testing.

UNIT V – REAL TIME APPLICATIONS AND BEST PRACTICES OF CLOUD 9

COMPUTING

Role of Cloud in Big data and IoT – Cloud Providers and their products – Amazon , Microsoft, VMware - Working with Google app engine and Hosting the application- Consideration before adopting cloud – Development and environments for service development – Best practices–Economics of choosing a cloud platform for an organization – Cloud computing Consumer case studies.

TOTAL = 45 Hours

COURSE OUTCOMES:
At the end of the course the student should be able to:
- Apply the service models and deployment models of cloud computing in real time.
- Analyze the details of virtualization and load balancing.
- Appraise the databases and security mechanism of cloud.
- Appraise the storage and testing mechanisms of Cloud Computing.
- Analyze the best practices of implementing cloud and the integration of latest technologies with cloud computing.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	PSOa	PSOb
P20MCA204.1	Apply the service models and deployment models of cloud computing in real time.	2	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204.2	Analyze the details of virtualization and load balancing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204.3	Appraise the databases and security mechanism of cloud.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204.4	Appraise the storage and testing mechanisms of Cloud Computing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA204.5	Analyze the best practices of implementing cloud and the integration of latest technologies with cloud computing.	3	3	3	3	3	3	3	2	1	3	2	3	3	3	3

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P20MCA205 – DATA SCIENCE

L	T	P	C	M
3	0	2	4	100

COURSE OBJECTIVES:
This course will enable the student to:
- Understand the basic concepts of Data Science and Big Data
- Understand the statistical concepts using R Language.
- Discuss various data models used data analysis.
- Discuss the concepts of data analysis using Hadoop
- Describe the Linear Transformations and Matrices

UNIT I –INTRODUCTION TO DATA SCIENCE AND BIG DATA   **9**

Introduction to Data Science – Data Science Process – Exploratory Data analysis –Big data: Definition, Risks of Big Data, Structure of Big Data – Web Data: The Original Big Data- Evolution of Analytic Scalability – Analytic Processes and Tools – Analysis versus Reporting – Core Analytics versus Advanced Analytics – Modern Data Analytic Tools – Statistical Concepts: Sampling Distributions - Re-Sampling – statistical inference – Introduction to Data Visualization.

UNIT II DATA ANALYSIS USING R   **9**

Univariate Analysis: Frequency. Mean. Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis –Bivariate Analysis: Correlation – Regression – Multivariate Analysis – Graphical representation of Univariate, Bivariate and Multivariate Analysis – Graphical representation of Univaruate, Bivariate and Multivariate Analysis in R: Bar Plot, Histogram, Box Plot, Line Plot, Scatter Plot, Lattice Plot, Regression Line, Two-way cross Tabulation.

     9

UNIT III – DATA MODELING

Bayesian Modeling – Support Vector and Kemel Methods – Neuro – Fuzzy Modeling – Principal Component Analysis – Introduction to NoSQL: CAP Theorem, MongoDB: RDBMS Vs MongoDB, Mongo DB Database Model, Data Types and Sharding – Data Modeling in HBase: Defining Schema – CRUD Operations

     9

UNIT IV DATA ANALYTICAL FRAMEWORKS

Introduction to Hadoop: Hadoop Overview – RDBMS Versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication –Introduction to MapReduce – Running Algorithms Using MapReduce – Introduction to HBase: HBase Architecture, HLog and HFile, Data Replication – Introduction

     9

UNIT V LINEAR TRANSFORMATION & MATRICES

Introduction to linear transformations - General linear transformations - Kernel & Range - Matrices of general linear transformations - Eigen Values & Eigen Vectors: Introduction to Eigen values -

Diagonalizing of a matrix - Orthogonal diagonalization - Application of differential equation.

List of Programs

1. Download, install and explore the features of R/Python for data analytics.
2. Use the Diabetes data set from UCI and Pima Indians Diabetes data set for per forming the following
   a. Univariate Analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
   b. Bivariate Analysis: Linear and logistic regression modeling.
   c. Multiple Regression Analysis
   d. Also compare the results of the above analysis for the two data sets.
3. Apply Bayesian and SVM techniques on Iris and Diabetes data set.
4. Apply and explore various plotting functions on UCI data sets.
5. Perform setting up and installing Hadoop in its two operating modes: pseudo-distributed and fully distributed.
6. Implement the following file management tasks in Hadoop: adding files and directories, Retrieving files and Deleting files
   a. Performing a MapReduce Job for word search count (look for specific keywords in a file)
   b. Implement step word elimination problem: Input a large textual file containing one sentence per file and a small file containing a set of stop words (one stop word per line) and save the results in an output textual file containing the same sentences of the large input the without the words appearing in the small file.
7. Implement a MapReduce program that processes a weather data set to:
   a. Find average, max and min temperature for each year in National Climate Data Centre data set.
   b. Filter the readings of a set based on Value of the measurement. The program must save the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.
8. Mini projects on the following:
   a. Simulate a simple recommender system with Amazon product dataset, Social tweet data set etc. on Hadoop.
   b. Perform a very large text classification run on Hadoop.

TOTAL = 75 Hours

COURSE OUTCOMES:
At the end of the course the student should be able to:
- Apply the modern analytical tools on Big data.
- Experiment with statistical concepts using R language
- Experiment various data models using R Language
- Perform a Data Analysis Using Hadoop Framework
- Illustrate all the strategies on Linear Transformations and Matrices.

REFERENCES
1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, First Edition, 2013.
2. Umesh R Hodeghatta, Umesh Nayak, "Business Analytics Using in R – A Practical Approach", Apress, First Edition, 2017.
3. Howard Anton & Chris Rorres, "Elementary Linear Algebra", Wiley, Eleventh Edition 2013.
4. J. Leskowac, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets",Cambridge University Press, Second Edition, 2014.
5. Nishant Gerg, "Hbase Essentials", Packt, First Edition, 2014.
6. Rachel Schutt, Cathy O'Nell, "Doing Data Science",O'Reilly, First Edition, 2013.
7. Foster Provost, Tom Fawcet, "Data Science for Business",O'Reilly, First Edition, 2013.
8. Bert Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley, First Edition, 2014.

CO No	Course Outcome (CO)	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA205.1	Apply the modern analytical tools on Big data	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205.2	Experiment with statistical concepts using R language	3	3	3	3	3	3	3	2	1	3	3	3	2	3	3
P20MCA205.3	Experiment various data models using R Language	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205.4	Perform a Data Analysis Using Hadoop Framework	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3
P20MCA205.5	Illustrate all the strategies on Linear Transformations and Matrices	3	3	3	3	3	3	3	2	1	3	1	3	2	3	3

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P20MCA206 - MOBILE APPLICATION DEVELOPMENT

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:
This course will enable the student to:
- Relate the need of mobile applications and point out the importance of it.
- Discuss on the basic concepts of android.
- Identify the components beyond user interface and use them in an application.
- Describe the advanced application development in android.
- Discuss the basic concepts of iOS application development.

UNIT I - INTRODUCTION TO MOBILE APPLICATIONS   7

Introduction to mobile applications - Mobility landscape - Mobile platforms - Mobile apps development – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications – Market and business drivers for mobile application.

UNIT II –ANDROID INTRODUCTION   9

Android Introduction - Android features - Android Architecture – Mobile UI resources (Layout, Fragment, UI elements, Drawable, Menu) - Activity – states and life cycle - Interaction amongst activities – Notifications.

UNIT III –ANDROID APP DEVELOPMENT   10

Threads – Async tasks - Services – states and lifen b   cycle – Shared preferences - Broadcast receivers - Telephony and SMS APIs - Animation

UNIT IV –ANDROID ADVANCED CONCEPTS   10

Multimedia-Audio/Video Playback and Record – Location Awareness – Native Hardware access using Accelerometer and Gyroscope– Mobile Databases using SQlite - Content Providers - Introduction to material designing

UNIT V – iOS INTRODUCTION AND APP DEVLOPMENT   9

Basics of Swift for iOS App development - iOS Introduction - features –Architecture - iOS Actions and Outlets – Story Board – Views - Simple iOS Application - iCloud introduction - iPhone market place.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Analyze the significance of mobile application development and its market value.

- Develop real time mobile applications and discuss the architecture, platform and tools required for mobile application.

- Design and develop an application with the given component.

- Develop an application beyond user interface with intricate tools like mobile databases, sensors, animation, multimedia etc.

- Analyze the Architecture, iCloud and the concepts of iOS.

REFERENCES

1. "Composing Mobile Apps: Learn, Explore, Apply using Android ", Anubhav Pradhan, Anil V. Deshpande, Wiley Publications, 2014.

2. "IOS 12 Programming for Beginners", Craig Clayton ,Packt publishing 3rd Edition.

3. Android Application Development All in one for Dummies, Barry Burd, Wiley Publications (Edition 1)

4. Teach Yourself Android Application Development in 24 Hours, Lauren Darcey & Shane Conder, SAMS Publication, 2010.

5. "Microsoft Mobile development Handbook", Andy Wigley, Microsoft Publications, 2001.

6. "iOS Apps for Masterminds ",J.D.Gauchat,Registration number 1126232, 4th edition, 2018.

7. "Learning Swift: Building Apps for macOS, iOS, and Beyond ",Jonathon Manning ,Paris Buttfield-Addison ,Tim Nugent ,O'reilly , 3rd Edition.

CO No	Course Outcomes - Mobile Application and Development	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	PSOa	PSOb
P20MCA206.1	Analyze the significance of mobile application development and its market value	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA206.2	Develop real time mobile applications and discuss the architecture , platform tools required for mobile applications	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA206.3	Design and develop and application with the given component.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA206.4	Develop an application beyond user interface with intricate toolslike mobile databases,sensors, animation , multimedia etc	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA206.5	Analyze the architecture , iCloud and the concepts of iOS.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3

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P20MCA207 – INTERNET PROGRAMMING LABORATORY

L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- To be familiar with Web page design using HTML/XML and style sheets
- To learn to create dynamic web pages using server side scripting.
- To learn to write Client Server applications.
- To develop a web application using Spring.
  To implement a Persistence layer using Hibernate and Spring Data JPA

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML
2. To embed a map in a web page
3. To fix the hot spots in that map
4. Show all the related information when the hot spots are clicked.
5. Create a web page with the following.
6. Cascading style sheets.
7. Embedded style sheets.
8. Inline style sheets. Use our college information for the web pages.
9. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
10. Write programs in Java using Servlets:
11. To invoke servlets from HTML forms
12. Session tracking using hidden form fields and Session tracking for a hit count
13. Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
14. Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
15. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
16. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
17. Create a Spring MVC application. The application should handle form validation, file upload, session tracking.
18. Design a complex system using JPA and Hibernate. The system should have multiple entities and relationships between the entities. The database schema should be generated through Hibernate. Provide RESTful endpoints for CRUD operations for the defined entities. Also, support pagination and searching using JPA's JPQL and Criteria API.

TOTAL = 60 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:
- Upon Completion of the course, the students will be able to:
- Construct web pages using HTML/XML and Style sheets
- Build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- Develop dynamic web pages using server side scripting
- Develop applications in Spring
- Develop applications in JPA and hibernate

CO No	Course Outcomes - Internet Programming Lab	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA207.1	Construct web pages using HTML/XML and style sheets	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.2	Build dynamic web pages with validation using JavaScript objects and by applying different event handling mechanisms.	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.3	Develop dynamic web pages using server side scripting	2	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.4	Develo applications in Spring	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3
P20MCA207.5	Develop applications in JPA and hibernate	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3

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	L	T	P	C	M
P20MCA208 - CLOUD COMPUTING	0	0	4	2	100

P20MCA208 - CLOUD COMPUTING TECHNOLOGIES LABORATORY

COURSE OBJECTIVES

- Relate the application of cloud computing with real time.
- Develop SaaS application in cloud CRM.
- Develop sample programs in any of the on demand cloud CRM in the market
- Create applications in cloud CRM in a very short time without any developmental cost.
- Understand cloud containers.

LIST OF PROGRAMS

Develop applications in Cloud:

Cloud CRM:

1. Formula and Validation – Basic and Advanced level.
2. Workflow Process
3. Automation Process
4. Apex triggers
5. Data management
6. Visual Force pages
7. SaaS Application
8. Einstein dashboard – Reports
9. AI for business

Open source Cloud Containers:
10. Containers - Kubernetes

COURSE OUTCOMES
At the end of the course the student should be able to:

- Create real time applications that uses formulas, validation, and workflow and automation process in Cloud CRM.
- Create applications that describes Visual Force pages, Apex triggers, Data Management tools in Cloud CRM.
- Appraise open source cloud containers and learn its implementation

TOTAL = 60 Hours

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA208.1	Create real time applications that uses formulas, validation, and workflow and automation process in Cloud CRM.	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA208.2	Create applications that describes Visual Force pages, Apex triggers, Data Management tools in Cloud CRM.	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3
P20MCA208.3	Appraise open source cloud containers and learn its implementation	1	3	3	3	3	3	3	2	1	3	2	3	3	3	3

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P20MCA209 - Soft Skills and Aptitude Career Enhancement Laboratory -II   L   T   P   C Marks

0   0   2   1   100

COURSE OUTCOMES:

At the end of the course the student will be able to:

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches

2. Solve problems of advanced levels than those in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

3. Demonstrate greater than level of verbal aptitude skills in English with regard to given topics and score 70-75% marks in company-specific internal tests.

4. Make effectively oral presentation and take part in group discussions and write formal letters, memos, paragraphs and notices

1. Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a) Presentation Skills b) Team work c) Leadership Skills d) Listening Skills e) Critical Thinking (Observation, Analysis, Interpretation, Reflection, Evaluation, Inference, Explanation, Problem Solving and Decision Making)
2. Quantitative Aptitude and Logical Reasoning	**Solving problems with reference to the following topics:** a) Percentage b) Profit, loss & Discount c) Time & Work , Pipes & Cisterns d) Partnership e) Time Speed and Distance f) Interest Calculations g) Logarithm h) Data Sufficiency i) Ranking & Ordering j) Data Interpretation k) Company specific aptitude questions-1
Focus on language	**Demonstrating verbal ability skills in English with reference to the following topics:** a. **S**ubject verb agreement b. Modal verbs c. Reading comprehension d. Spotting errors e. Choosing the correct / incorrect sentences f. Describing the picture g. Critical Reasoning h. Theme Detection i. Cloze test
Speaking	Mini presentation and group discussion
Writing	Paragraph writing, e-mail, letter to editors and memos

| **Reading** | Reading advertisements and graphs, reading passages for specific information transfer |

TOTAL = 30 Hours

CO / PO, PSO Mapping													
MCA													
COs, POs PSOs Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**
CO – 1	1	1	2	1	1	3	3	3	1	1	2	1	3
CO – 2	1	1	1	1	1	3	3	2	1	2	2	S	2
CO – 3	1	1	1	1	1	3	3	3	1	3	2	1	2
CO – 4	1	1	1	1	1	3	3	3	1	2	2	1	2

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ELECTIVE - I

noc23-cs46 –

Object Oriented System Development Using UML, Java and Patterns

By Prof. Rajib Mall | IIT Kharagpur

PREREQUISITES   **:** Programming Using Java, Software Engineering

COURSE LEVEL   **:** Postgraduate

COURSE LAYOUT

Week 1	**:**	Introduction
Week 2	**:**	Life Cycle Models for OO Development
Week 3	**:**	Use Case Diagram
Week 4	**:**	Class Diagram I
Week 5	**:**	Class Diagram II
Week 6	**:**	Sequence Diagram
Week 7	**:**	State chart diagram
Week 8	**:**	Design process
Week 9	**:**	Introduction to design patterns
Week 10	**:**	GRASP patterns
Week 11	**:**	GoF pattern I
Week 12	**:**	GoF Pattern II

Status :	Ongoing
Course Type :	Elective
Duration :	12 weeks
Start Date :	23 Jan 2023
End Date :	14 Apr 2023
Exam Date :	29 Apr 2023 IST
Enrollment Ends :	06 Feb 2023
Category :	o Computer Science and Engineering o Programming
Credit Points :	3
Level :	Postgraduate

BOOKS AND REFERENCES

1. Robert Martin, UML for Java Programmers, Pearson, Ali Bahrami, Object-oriented System Development, TMH, 1999

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noc23-cs50 – Programming in Modern C++

Prof. Partha Pratim Das | IIT Kharagpur

COURSE LEVEL   : Undergraduate/Postgraduate

PREREQUISITES : Programming & Data Structure (mandatory), Programming in C (optional), Design and Analysis of Algorithms (optional)

COURSE LAYOUT

Week 1	:	Programming in C++ is Fun.
Week 2	:	C++ as Better C.
Week 3	:	OOP in C++.
Week 4	:	OOP in C++.
Week 5	:	Inheritance.
Week 6	:	Polymorphism.
Week 7	:	Type Casting.
Week 8	:	Exceptions and Templates.
Week 9	:	Streams and STL.
Week 10	:	Modern C++.
Week 11	:	Lambda and Concurrency.
Week 12	:	Move, Rvalue and STL Containers.

Course Status :	Ongoing
Course Type :	Core
Duration :	12 weeks
Start Date :	23 Jan 2023
End Date :	14 Apr 2023
Exam Date :	29 Apr 2023 IST
Enrollment Ends :	06 Feb 2023
Category :	o Computer Science and Engineering
Credit Points :	3
Level :	Undergraduate/Postgraduate

BOOKS AND REFERENCES

Online Material:

1. C++ reference - C++98 and C++03, C++11, C++14.
2. Overview of the New C++ (C++11/14) by Scott Meyers, 2015.
3. ISO C++ Standards.
4. Presentations used in the Course.

Books:

1. C++ Move Semantics - The Complete Guide by Nicolai M. Josuttis, 2020.
2. C++ Concurrency in Action, 2nd Edition by Anthony Williams, 2019.
3. C++17 - The Complete Guide by Nicolai M. Josuttis, 2020.
4. C++17 In Detail: Learn the Exciting Features of The New C++ Standard! by Bartlomiej Filipek, 2019.
5. Professional C++, 4th Edition by Marc Gregoire, 2018.
6. Functional Programming in C++ by Ivan Čukić, 2018.
7. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 by Scott Meyers, 2015.

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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for MCA III Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Theory					
1	P20MCA301	Embedded Systems and Internet of Things	3	0	0	3	45
2	P20MCA302	Cyber Security Essentials	2	0	0	2	30
3	P20MCA303	Artificial Intelligence and Machine Learning	3	0	0	3	45
4	P20MCA501	**Elective: Agile Technologies**	3	0	0	3	45
5	P20MCA512	**Elective: Advanced Web Programming ***	2	0	2	3	60
6	P20MCA513	**Elective: Microservices and DevOps**	3	0	0	3	45
	P20MCA534	**Elective: Digital Marketing**					
		Practical					
7	P20MCA304	Embedded Systems and Internet of Things Laboratory	0	0	4	2	60
8	P20MCA305	Artificial Intelligence and Machine Learning Laboratory	0	0	4	2	60
9	P20MCA306	Mini Project Laboratory	0	0	4	2	60
10	P20MCA307	Soft Skills and Aptitude Career Enhancement Laboratory - III	0	0	2	1	30
* Theory course with Laboratory Component					**Total Credits**	24	

Approved by

Chairperson, MCA BOS
Dr.T.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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05.07.2023

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Choice Based Credit System

CURRICULUM & SYLLABUS

THIRD SEMESTER

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

P20MCA301 – EMBEDDED SYSTEMS AND INTERNET OF THINGS

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Provide an overview of principles of Embedded System
- Understand the basics of IoT, communication models and emerging technologies.
- Exhibit domain and system management for IoT applications.
- Use cloud services for IoT applications.
- Learn real world application scenarios of IoT along with its societal and economic impact using case studies.

UNIT I - INTRODUCTION TO EMBEDDED SYSTEM   9

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems, General Computing Systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas, Purpose of Embedded Systems, Characteristics and Quality attributes of Embedded Systems. The Typical Embedded System: Core of the Embedded System, Memory, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components-Embedded System development environment – IDE- Embedded product development life-cycle.

UNIT II –DESIGN OF IoT   9

Introduction-Definition and characteristics of IoT-Physical design of IoT-Things in IoT and IoT protocols-Logical design of IoT-IoT functional blocks-IoT communication model and IoT communication APIs-IoT enabling technologies-Wireless Sensor Networks-Role of Cloud Computing and Big Data Analytics, IIOT, Industry 4.0-Communication protocols-IoT levels.

UNIT III - DOMAIN, M2M AND SYSTEM MANAGEMENT   9

Introduction – Home Automation-Cities-Industry-Health & Lifestyle-M2M-SDN and NFV for IoT-Software Defined Networking-Network Function Virtualization-IoT system management-Need for IoT system management – Simple Network Management protocol. Protocols: IEEE 802.15.4 – The IEEE 802 Committee Family protocols-The physical layer-The Media Access Control Layer-Uses of 802.15-BACNet Protocol-Modbus-KNX-Zigbee Architecture-Network Layer-APS layer-Security.

UNIT IV – DEVELOPING INTERNET OF THINGS   9

IoT Platforms Design Methodology-IoT System for Weather Monitoring-IoT System for Agriculture. Introduction to Cloud Storage Models & Communication APIs-WAMP-AutoBahn for IoT –Xively Cloud for IoT-Python Web Application Framework-Django Architecture – Development with Django Toolkit-Arduino –Rasberry Pi.

UNIT V – CLOUD SERVICES FOR IOT 9

Designing a RESTFUL Web API-Amazon Web Services for IoT – EC2-Autoscaling-S3-RDS-Dynamo DB-Kinesis-SkyNet IoT Messaging Platform. Case Studies – Environement-IoT systems for weather reporting Bot-Air Pollution Monitoring system-Forest Fire Detection-IoT system for Energy-Smart grid – Renewable Energy Systems.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Acquire knowledge and understand fundamental embedded system design paradigms and architecture.
- Illustrate the design, communication model and enabling technologies for IoT.
- Analyze the system management and domain for various applications of IoT.
- Classify the various protocols that are used for developing IoT applications.
- Identify the cloud services for various applications of IoT.

REFERENCES

1. Shibu K V, "Introduction to Embedded Systems", Second Edition, Mc Graw Hill, January 2020 (Unit 1).
2. Arshdeep Bahga and Vijay Madisetti, "Internet of Things, A Hands-on Approach", Universities Press, 2015 (Units 2 ,3 & 5).
3. Mayur Ramgir, "Internet of Things-Architecture, Implementation and Security", Pearson, August 2019.
4. Olivier Hersent, David Boswarthick, Omar Elloumi,"The Internet of Things-Key applications and Protocols", Wiley, 2012. (Unit 4)
5. Adrian McEwen, "Designing the Internet of Things", Wiley, 2014.
6. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, October 2015.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA301.1	Acquire knowledge and understand fundamental embedded system design paradigms and architecture.	3	2	3	3	2	2	2	2	3	2	3	3	2	3	2
P20MCA301.2	Illustrate the design, communication model and enabling technologies for IoT.	3	3	3	3	3	2	2	2	1	3	3	3	2	3	2
P20MCA301.3	Analyze the system management and domain for various applications of IoT.	3	2	3	3	3	2	2	2	2	2	3	3	2	3	2
P20MCA301.4	Classify the various protocols that are used for developing IoT applications.	3	2	3	3	2	2	2	2	3	2	3	3	2	3	2
P20MCA301.5	Identify the cloud services for various applications of IoT.	3	2	3	3	3	3	2	2	2	2	3	3	2	3	2

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P20MCA302 - CYBER SECURITY ESSENTIALS

	L	T	P	C	M
	2	0	0	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the various types of cybercrimes.
- Formulate the security problems in wireless devices and networks.
- Identify the different types of cybercrimes and its associated cyber laws.
- Gain knowledge about computer forensics and challenges in computer forensics.
- Discuss the social impacts of cybercrime and privacy protection in an organization.

UNIT I - INTRODUCTION TO CYBERCRIME   **6**

Introduction: Cybercrime - Cybercrime and Information Security - Cyber Criminals-Classification of Cybercrimes-Cyber Offenses: Attacks-Social Engineering- Cyberstalking-Cyber Cafe and Cybercrimes-Botnets.

UNIT II – CYBERCRIME : MOBILE AND WIRELESS DEVICES   **6**

Cybercrime : Mobile and Wireless Devices: Proliferation of Mobile and Wireless Devices-Credit Card Frauds in Mobile and Wireless Computing Era -Security Challenges Posed by Mobile Devices -Registry Settings for Mobile Devices -Authentication Service Security : Cryptographic Security for Mobile Devices - LDAP Security for Hand- Held Mobile Computing Devices -Attacks On Mobile Phones - Tools and Methods used in Cybercrime: Proxy Servers and Anonymizers – Phishing - Password Cracking - Key Loggers and Spywares - Buffer Overflow -Attacks on Wireless Networks.

UNIT III – CYBER SECURITY : LEAGAL PERSPECTIVE   **6**

Introduction – Cyber Security Evolution – Cyber Security Objectives - Cyberlaws: The Indian Context - Indian IT Act - Digital Signature and the Indian IT Act - Amendments to the Indian IT Act - Cybercrime and the Punishment –Cyberlaw - Technology and Students: Indian Scenario.

UNIT IV – COMPUTER FORENSICS   **6**

Introduction - Historical Background of Cyber Forensics - Digital Forensics Science - Need for Computer Forensics -Cyber Forensics and Digital Evidence - Forensics Analysis of E-Mail - Digital Forensics Life Cycle -Chain of Custody Concept - Network Forensics - Computer Forensic Investigation - Computer Forensic and Steganography -Challenges in Computer Forensics - Forensics Auditing – Anti-forensics.

UNIT V –SOCIAL IMPLICATIONS

Introduction - Cost of Cybercrime and IPR Issues -Web Threats for Organizations - Security and Privacy Implications from Cloud Computing - Social Media Marketing -Social Computing and Associated Challenges -Protecting People's Privacy in the Organization - Organizational Guide Lines for Internet Usage -Safe Computing Guidelines and Computer Usage Policy - Incident Handling -Forensics Best Practices for Organizations - Media and Asset Protection -Importance of endpoint Security in Organizations.

TOTAL = 30 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Acquire the knowledge about cybercrime and attacks in cybercrime.
- Explore the tools and methods used to protect wireless devices and networks from various attacks.
- Analyze various Indian acts imposed in cybercrime.
- Apply and know the importance of computer forensics in the digital world.
- Exhibit the media and asset protection of an organization.

REFERENCE BOOKS

1. Nina Godbole, Sunit Belapure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", 2019, Wiley Publications (Unit I – V).

2. Jennifer L. Bayuk,Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, Joseph Weiss, "Cyber Security Policy Guidebook", 2017, Wiley Pulications. (Unit -1)

3. Mayank Bhushan, Rajkumar Singh Rathore, Aatif jamshed "Fundamental of Cyber Security Principles, Theory and Practices", BPB Publications.

4. Thomas J. Mowbray, "Cyber Security Managing Systems, Conducting Testing and Investigating Intrusions", 2019, Wiley Publications.

5. Khadsare S, " Cyber Security HandBook ", 2017, Mrs. Deepthy Chaudry publications.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA302.1	Acquire the knowledge about cybercrime and attacks in cybercrime.	3	2	2	2	3	3	3	3	2	3	3	2	3	1	1
P20MCA302.2	Explore the tools and methods used to protect wireless devices and networks from various attacks.	3	1	1	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA302.3	Analyse various Indian acts imposed in cybercrime.	3	3	3	1	2	3	3	2	2	2	3	3	3	1	1
P20MCA302.4	Apply and know the importance of computer forensics in the digital world.	3	1	1	3	2	2	2	2	2	2	1	2	3	3	3
P20MCA302.5	Exhibit the media and asset protection of an organization.	3	3	3	2	3	2	2	2	2	2	3	2	1	3	3

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P20MCA303 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

L	T	P	C	M
3	0	0	3	100

COURSE OBJECTIVES:

 This course will enable the student to:

- Explain the principles of Artificial intelligence like problem solving, inference, perception.

- Understand the methods for knowledge representation, and learning.

- List the characteristics of Intelligent agents

- Design and implement the machine learning techniques for real world problems

- Gain experience in doing research using Artificial intelligence and Machine learning techniques.

UNIT I –INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

Foundation of AI-History of AI-State of Art.-Intelligent Agents: Agents and Environments - Concepts of Rationality-Nature of Environments-Structure of Agents. Problem Solving: Problem Solving by Search: Problem Solving Agents-Searching for Solutions-Uniform Search Strategies-Heuristic Search Strategies- local Search Algorithms and Optimization Problems.

UNIT II - KNOWLEDGE AND REASONING 9

Logical Agents: Knowledge Based Agents-Logic-Propositional Logic-Propositional Theorem Proving-Model Checking-Agent based on Propositional Logic. First-Order Logic: Syntax and Semantics- Using First-Order Logic-Knowledge Engineering. Inference in First-Order Logic: Prepositional Vs. First-Order Inference-Unification and Lifting-Forward Chaining-Backward Chaining –Resolution. Fuzzy Sets to Fuzzy Logic System in AI: Fuzzy sets – operations – Logic – rules – fuzzy inference system – fuzzification and defuzzification.

UNIT III - BAYESIAN LEARNING 9

Basic Probability Notation- Inference – Independence - Bayes Rule. Bayesian Learning: Maximum Likelihood and Least Squared error hypothesis-Maximum Likelihood hypotheses for predicting probabilities- Minimum description Length principle -Bayes optimal classifier - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm.

UNIT IV - MACHINE LEARNING PARAMETRIC MODELS   **9**

Supervised Learning – Regression and classification – Evaluating and choosing best Hypothesis - Perceptron – Artificial Neural Networks – Fuzzy Neurons and Fuzzy Neural networks - Multi – class Classification - Backpropagation – Non-linearity with activation functions (Tanh, Sigmoid, Relu, PRelu) - Dropout as regularization.

UNIT V - MACHINE LEARNING NON- PARAMETRIC MODELS   **9**

k- Nearest Neighbors- Learning Decision Trees – Inducing – attribute tests - Generalization and Overfitting – application - Ensemble learning - Boosting - Adaboost algorithm. Support Vector Machines – Large Margin Intuition – Loss Function - Hinge Loss – SVM Kernels – Case Study.

                                                                TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Apply AI techniques in problem solving context.
- Implement Knowledge and Reasoning in the real world problems.
- Design a model with the required Learning features in AI applications.
- Analyze the working model and features of Decision tree.
- Apply k-nearest algorithm for the appropriate research oriented problems.

REFERENCES

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition Pearson Education Limited, 2015 (Unit 1-5).
2. CalumChace, "Surviving AI: The Promise and Peril of Artificial Intelligence", Three CS publication, Second Edition, 2015.
3. Christopher M Bishop, "Pattern Recognition and Machine Learning", Spring 2011 Edition.
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference and Prediction", Springer 2nd Edition.
5. EthemAlpaydin, "Introduction to Machine Learning", Second Edition, MIT Press, 2010.
6. Tom M. Mitchell, "Machine Learning", India Edition, 1 st Edition, McGraw-Hill Education Private Limited, 2013.
7. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2012 .
8. Nikola K. Kasabov, Foundation of Neural Networks, Fuzzy Systems, and Knowledge Engineering, The MIT Press, 1998.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA303.1	Apply AI techniques in problem solving context.	3	3	3	3	3	1	3	1	1	3	1	3	2	3	3
P20MCA303.2	Implement Knowledge and Reasoning in the real world problems.	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
P20MCA303.3	Design a model with the required Learning features in AI applications.	3	3	3	3	3	3	3	2	1	3	3	3	3	3	3
P20MCA303.4	Analyze the working model and features of Decision tree.	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3
P20MCA303.5	Apply k-nearest algorithm for the appropriate research oriented problems.	3	3	3	3	3	3	3	3	2	3	3	3	2	3	3

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		L	T	P	C	M
		0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand Arduino UNO and Raspberry Pi architecture.
- Setup the IDE and write embedded code.
- Learn real world application scenarios of IoT with societal and economic impact.
- Apply design concept to IoT solutions.
- Develop comprehensive approach towards building small low cost embedded IoT system.

The following experiments should be practiced in Arduino Platform

1   (a) Write a script to turn the Arduino LED on and off every second.

    (b) Write a script that allows the user to turn the Arduino LED on and off with a time delay.

2   Write a script to control Arduino LED. When the user enters the value 1, the LED has to turn on and similarly, when the user enters the value 0, the LED has to turn off. Also when the user enters "Quit", the application has to end.

3   Write a script using Arduino UNO to turn on LED and buzzer alarm.

4   Write a script to read a photosensor connected to an Arduino and turn on and off an LED based on light intensity level. So, when your room is dark, your LED must turn on.

5   Write a script to control the stepper motor (brushless DC motor) using Arduino UNO.

6   Write a script for distance measurement using Ultrasonic sensor and Arduino UNO.

The following experiments should be practiced in Raspberry Pi Platform

1   Write a script to blink on alternative LEDs on and off every second using Raspberry Pi.

2   Write a script with Raspberry Pi to make the LEDs blink on and off like a heartbeat: 2 quick flashes in succession and then a longer delay.

3   Write a script using Raspberry Pi to make the LEDs blink when a button is pressed.

4   Write a script using Raspberry Pi so that whenever you press the button a variable is incremented by one and is printed on the screen. This should work as a simple button counter. Start at 0, and each time you press the button it counts up on the screen.

5   Write a script to turn LED On and Off when the value "1/0" is received from smartphone using Bluetooth.

6   Write a script to detect the vertical (Y-axis) and horizontal (X-axis) movement of Analog Joystick.

7   Write a script to talk to a TMP102 Temperature sensor and display the temperature data into the terminal screen. Note: The temperature sensor can measure the temperature for: light/humidity/wind speed/air pressure/people entering your room etc.,)

TOTAL: 60 hours

COURSE OUTCOMES:
At the end of the course the student should be able to:

- Design and develop an environment friendly IoT enabled devices.
- Provide embedded system solutions for societal needs.
- Work individually and in a group to develop embedded systems.
- Apply skills to conduct interfacing of Arduino board with components, actuators and sensors.
- Configure and work with Raspberry Pi controller circuits.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA304.1	Design and develop an environment friendly IoT enabled devices.	3	2	3	3	2	2	2	2	1	2	3	3	2	3	2
P20MCA304.2	Provide embedded system solutions for societal needs.	3	3	3	3	3	2	2	2	1	3	3	3	2	3	2
P20MCA304.3	Work individually and in a group to develop embedded systems.	3	2	3	3	3	2	2	2	2	2	3	3	2	3	2
P20MCA304.4	Apply skills to conduct interfacing of Arduino board with components, actuators and sensors.	3	2	3	3	2	2	2	2	1	2	3	3	2	3	2
P20MCA304.5	Configure and work with Raspberry Pi controller circuits.	3	2	3	3	3	3	2	2	2	2	3	3	2	3	2

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P20MCA305 – ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

L	T	P	C	M
0	0	4	2	100

COURSE OBJECTIVES:

This course will enable the student to:

- Familiarize with the machine learning algorithms and implement in practical situations.
- Demonstrate AI algorithms and techniques.
- Learn to use different algorithms for real time data sets.

LIST OF EXPERIMENTS

1. Write a program to illustrate problem solving as a search and also apply local search algorithms.
2. Write a program to demonstrate logical agents.
3. Evaluate forward chainer and rule base on at least four different databases. Try to create at least one database that demonstrates an interesting feature of the domain, or an interesting feature of forward chaining in general.
4. Demonstrate agent based on propositional logic.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file.
8. Write a program to implement k-Nearest Neighbor algorithm to classify the data set.
9. Apply the technique of pruning for a noisy data from any sample data set and derive the decision tree. Analyze the results by comparing the structure of pruned and unpruned tree.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
11. Implement Support Vector Classification for linear kernel.
12. Implement Logistic Regression to classify the problems such as spam detection. Diabetes predictions so on.

TOTAL: 60 hours

COURSE OUTCOMES:

- Increase the problem-solving skills using AI techniques.
- Apply knowledge, reasoning and Learning algorithms in real-world context applications that increase the performance of system.
- Organize the data set using classification techniques.
- Analyze and predict the data sets using ML techniques.
- Create an application to test the data with appropriate algorithms in Neural Network system.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA305.1	Increase the problem solving skills using AI techniques.	3	3	3	3	3	2	3	1	1	3	1	3	2	3	3
P20MCA305.2	Apply knowledge, reasoning and Learning algorithms in real-world context applications that increase the performance of system.	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3
P20MCA305.3	Organize the data set using classification techniques.	3	3	3	3	3	1	3	2	1	3	3	3	1	3	1
P20MCA305.4	Analyse and predict the data sets using ML techniques.	3	3	3	3	3	1	3	3	1	3	3	3	3	3	1
P20MCA305.5	Create an application to test the data with appropriate algorithms in Neural Network system.	3	3	3	3	3	1	3	3	2	3	3	3	3	3	3

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P20MCA306 - MINI PROJECT LABORATORY

L	T	P	C	M
0	0	4	2	100

Course Objective:

- Understand the software engineering principles in developing software solutions to the society-needs problems and deploy as a Microservice.

- Apply advancement in techniques and tools to support the frequent releases of software product

- Build the strong network of stakeholders to get better experiences in Industrial/IT knowledge.

SCOPE OF THE COURSE:

Every student is required to carry out in-house Mini Project work under the supervision of a faculty member of the department. The students can do a project in a group of size between 4 and 5. The guide shall monitor progress of the student continuously. A candidate is required to present the progress of the Mini Project work once in a month during the semester at an appropriate time decided by the Department. There will a final presentation of the Mini Project work at the end of the semester. It is recommended that Mini Project is to be chosen which should have some direct relevance in day-to-day activities of the candidates in his/her institution.

The purpose of the project is to apply Microservices and DevOps concepts in the required fields, help the student to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories, this project will helps the student make ease and provides enough experience to carry out the larger project in the fifth and sixth semester.

AIM:

Students should identify society-needs problems that analyze/plan the requirements, schedule, cost estimation & methodologies/technologies to be proposed, design and implement into IT outlook software solution. The domain of the problem may be identified from the emerging area of an application and deploy into Microservices like as follows:

- Feedback application
- Registration and login form
- Contact Form
- Payment Form
- Catalogue Form

- Review/Comments
- Profile creation/setting
- Booking services
- Order & Cart Form
- GPS Location tracking
- Sensors reading using Arduino/Raspberry Pi
- Consuming any third party web services.

The evaluation of the project would be based on the need of the hour and request from stakeholders, usefulness of the problem statement, formulation of the problem, stakeholders need and the usage statistics of the solution and the technical merit of the solution.

The project design, development and testing phases can be as shown below:

PHASES:

1. **Requirements Engineering Phase:**
   - Problem identification.
   - Feasibility study of domain.
   - Requirement elicitation and analysis.

   The above mentioned topic should document the Software Requirements Specification (SRS) for the identified development, operations and micro services along with the following.
      o Timeline chart/Project schedule
      o Estimation with chart

2. **Team Formation Phase:**
   - Teams formation, roles identified, activities framed

3. **Design Phase:**
   - Architectural design.
      ▪ Case studies in sample application for each type of architecture, popular enterprise applications, cloud computing platforms comparison, DevOPs solution fundamentals, applications of SOA and MSA (Microservice, Architecture), OOAD and SOAD comparison, Identifying simple services based on SOA and MSA.
      ▪ UML Diagram (Use case, Conceptual classes, process flow diagram, sequence & activity diagram, etc.,)
      ▪ System architecture

- Front-End Design.
  - UI design
- Component Design.
  - API Design
- Back-end design.
  - E-R model
  - Database Design

4. **Implementation Phase:**
- Development, operations and micro services proposal scheme
- Front-end and Back-end Coding in a suitable language using necessary platforms and tools.
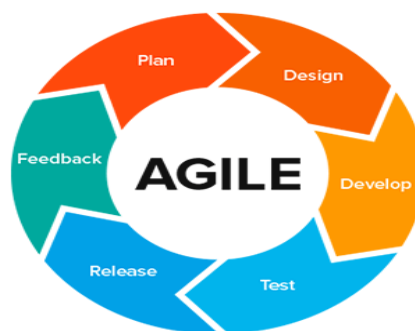
5. **Testing And Validation Phase:**
  - Develop test cases
  - Component Testing
  - System Testing
  - Acceptance Testing
  - Testing reports

6. **Deployment & Feedback Phase:**
- Web services and micro services
  - Implementing XML, DOM and SAX
  - Creation of web services in Java/.NET/Python environment, RESTful web services.
- Implementation of Microservices architecture with python.
- Creation of container services.
- Cloud deployment.
- Case Study of middleware services for IoT, mobile services
- Reviews & Feedback Collection

Project Development Should be based on Agile methodology,

MINI PROJECT PROPOSAL (SYNOPSIS) STRUCTURE

Mini Project proposal should be prepared in consultation with the guide. It should clearly state the objectives and environment of the proposed Mini Project to be undertaken. Ensure to include the following items while submitting your Mini Project synopsis. Mini Project synopsis may contain 15-25 pages and sequence of contents strictly should be in the following order:

1. Cover and Title page

2. Synopsis Approval Performa duly filled and signed by the student

3. Index

4. Acknowledgement

5. Introduction and objective of the Mini Project

6. System Study (Literature Survey, Proposed Methodology)

7. Feasibility Study

8. System Requirements

9. System Design

10. Development & Feedback

11. Deployment & Conclusion

12. Scope of future application

13. References

COMMUNICATION OF SYNOPSIS APPROVAL

A list of approved synopsis will be put on the notice board of the Institute as per the dates mentioned in the activity schedule. In case of non-approval, the suggestions for reformulating the Mini Project will be communicated to the student. Students can resubmit the modified synopsis to Project In-Charge of the Department of Master of Computer Applications as per the specified time given in activity schedule.

MINI PROJECT REPORT STRUCTURE

The Mini Project should be prepared in consultation with the guide and may contain 100-150 pages (including coding). Mini Project Report should strictly follow the points given below:

Details

1. Cover and Title page

2. Synopsis Approval Certificate

3. Index

4. Acknowledgement

5. Certificate of Originality

13. UI Design/Development

14. Coding

15. Validation & Verification

16. Testing (Testing techniques, Testing strategies, Use Cases)

6. Introduction, Aims / Objectives

7. System Study

    Problem Identification

    Literature Study

    The scope of problem

8. Feasibility Study

    8.1. Technical Feasibility

    8.2. Economic Feasibility

    8.3. Operational Feasibility

9. Proposed Methodology

10. S/W Engineering Paradigm applied

11.System Specification

12. System Design (DFD 0 Level, 1- Level and 2 Level/ER Diagram, and Data structure, Table structure, etc.)

17. Implementation and Maintenance

18. System Security & Performance measurements

20. Reports, Pert Chart/Gantt Chart, Summary/Conclusion

21. Future scope of the Mini Project

22. Bibliography/References/Glossary

23. Document Approval

SYNOPSIS SUBMISSION OF A MINI PROJECT REPORT

Only one Copy of the Mini Project report in bound form is to be submitted to the Project In-Charge of the Department of Master of Computer Applications. Another copy of the Mini Project Report must be retained by the student which should be produced before the examiner at the time of the Viva-voice.

MINI PROJECT EVALUATION

As per the norms Mini Project Report shall be evaluated by the examiner at the end of the semester. However there will be continuous monitoring of the Mini Project progress report during the semester and distribution of marks shall be as follows:

- 5 reviews – 40 (8 marks for each review)
- Documentation - 20
- Viva 1 – 10
- Project evaluation – 30

LIST OF BROAD AREAS OF APPLICATIONS AND RELATED TOOLS

- **Technology:** Visual studio 2008, .NET framework, J2EE, Spring, AngularJS.
- **Front-End Development:** UI Design Tools, PHP, React js, etc.,
- **Back-End Development:** NoSQL, SQL Server, Oracle 10g, MySQL, MongoDB, Django, Sybase
- **Languages:** C, C++, C#, Java, VC++, Python

- **Internet Technologies:** HTML, DHTML, XML, CSS, JavaScript, DOM, JQuery, AJAX, node.js, ASP, JSP, Java Servlet, Perl & CGI script, VBscript, Swing, XSL, Java Beans, UML, EDA, Broadvision, ATG, NET Dynamics, Silver Stream, Cold Fusion, etc.,
- **Web Server:** IIS, APACHE, TOMCAT, GlassFish, etc.,
- **Networking Technologies:** ATM, Frame Relay, TCP/IP, SNMP, GSM, VOIP, PPP, IP-PSTN, SONET/SDH
- **Wireless Technologies:** 2G, 3G, 4G, Bluetooth, Wi-Fi, ISDN, Edge, etc.,
- **Real-time OS/ Embedded Skills:** QNX, LINUX, OSEK, DSP, VRTX, RTXC, Nucleus, etc.,
- **Operating System:** Windows XP/VISTA/7, Windows Server 2008, MS-DOS, LINUX SUN, VRTX, SOLARIS, HP/UX, PSOS, IRIX, Ubuntu, Mac OS, Fedora, Debian, etc.,
- **Project Management Tools:** JIRA, Kanban, GitHub, Smartsheet, Zoho Sprint, pivotal Tracker, etc.,

Course Outcome:

The students are able to

- Become an expert as a software engineer to execute the project with expected product.
- Obtain good exposures to lead the teams and maintain good relationship between IT industries and customers.
- Become a specialist to deploy and manage the Microservices.

TOTAL: 60 hours

CO No	Course Outcome(CO) On completion of the course the student should be able to :	POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	PSOa	PSOb
P20MCA306.1	Become an expert as a software engineer to execute the project with expected product.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
P20MCA306.2	Obtain good exposures to lead the teams and maintain good relationship between IT industries and customers.	1	1	2	3	3	3	3	3	3	3	3	1	3	3	3
P20MCA306.3	Become a specialist to deploy and manage the Microservices.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

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P20MCA307 - Soft Skills and Aptitude Career Enhancement Laboratory - III

L	T	P	C	Marks
0	0	2	1	100

COURSE OUTCOMES:

At the end of the course the student will be able to:

1. Demonstrate capabilities in supplementary areas of soft-skills and job-related selection processes using hands-on and/or case-study approaches

2. Solve problems of advanced levels than those in specified areas of quantitative aptitude and logical reasoning and score 70-75% marks in company-specific internal tests

1. Soft Skills	**Demonstrating soft-skill capabilities with reference to the following topics:** a. Career Planning b. Resume Writing c.Interview Skills d.Group Discussion Techniques e. Mock GD's f. Mock Interview.
2.Quantitative Aptitude and Logical Reasoning Topics	**Solving problems with reference to the following topics :** a. Permutation and Combination b. Probability c. Crypto Arithmetic d. Functions & Polynomials e. Geometry & Mensuration f. Syllogism g. Cubes & Dice h. Visual Reasoning i. Inequalities j. Analogies k. Number Series l. Company Specific Questions - 2
3. Verbal Ability	**Demonstrating English language skills with reference to the following topics:** a. Select the best alternative for the underlined part of the sentence b. Writing a quote for the given picture c. Writing story on a given picture d. Critical Reasoning e. Theme detection
4. Speaking	Interviews and presentation
5. Writing	Essay writing and story writing
6. Reading	Reading comprehension

TOTAL: 30 hours

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
Programme												
COs, POs PSOs Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13
CO – 1	1	1	2	1	1	3	3	3	1	1	2	1	3
CO – 2	1	1	1	1	1	3	3	2	1	2	2	3	2
CO – 3	1	1	1	1	1	3	3	3	1	3	2	1	2
CO – 4	1	1	1	1	1	3	3	3	1	2	2	1	2

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P20MCA501 – AGILE TECHNOLOGIES

L	**T**	**P**	**C**	**M**
3	**0**	**0**	**3**	**100**

COURSE OBJECTIVES:
This course will enable the student to:
- To understand the basic concepts of Agile Software Process.
- To gain knowledge in the area of various Agile Methodologies.
- To develop Agile Software Process
- To know the principles of Agile Testing
- Assess product quality risks within an Agile project

9

UNIT I – INTRODUCTION
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods – Agile Manifesto and principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams – Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values.

UNIT II - AGILE PROCESS 9
Lean Production – SCRUM, Crystal, Feature Driven Development – Adaptive Software Development – Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III - AGILITY AND KNOWLEDGE MANAGEMENT 9
Agile Information Systems – Agile Decision Making – Earl's Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment, Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV – AGILITY AND REQUIREMENTS ENGINEERING 9
Impact of Agile Processes in Re-Current Agile Practices – Variance – Overview of Re using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V – AGILITY AND QUALITY ASSURANCE 9
Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance – Test Driven Development – Agile Approach in Global Software Development – Agile Scrum – Scrum Master – Scaling Projects using Scrum.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Demonstrate a systematic understanding of current agile techniques and practices used in industry.
- Apply industry standard agile techniques in develop software in a team.
- Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.
- Apply concepts of XP and EVE in develop a software.
- Managing the changes applying different testing techniques.

REFERENCES

1. Mark Merkow, "Secure, Resilient, and Agile Software Development", Auerbach Publications; First edition, 2019.
2. Craig Larman "Agile and Iterative Development – A Manager's Guide" Pearson Education, Third Edition, 2012.
3. Konnor Cluster, "Agile Project Management: Learn How To Manage a Project With Agile Methods, Scrum, Kanban and Extreme Programming", 2019.
4. Mark C. Layton (Author), Steven J. Ostermiller,"Agile Project Management For Dummies", Second Edition, 2017.
5. Shore, "Art of Agile Development" Shroff Publishers & Distributors, 2007
6. Geoff Watts, "Scrum Mastery: From Good To Great Servant-Leadership", Inspect & Adapt Ltd, First edition, 2013.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA501.1	Demonstrate a systematic understanding of current agile techniques and practices used in industry.	3	2	2	2	3	3	3	3	2	3	3	2	3	1	1
P20MCA501.2	Apply industry standard agile techniques in develop software in a team.	3	1	1	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA501.3	Use group and individual retrospectives to critically evaluate and propose improvements in developing software in a professional context.	3	3	3	1	2	3	3	2	2	2	3	3	3	1	1
P20MCA501.4	Apply concepts of XP and EVE in develop a software.	3	1	1	3	2	2	2	2	2	2	1	2	3	3	3
P20MCA501.5	Managing the changes applying different testing techniques.	3	3	3	2	3	2	2	2	2	2	3	2	1	3	3

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P20MCA512 - ADVANCED WEB PROGRAMMING

	L	T	P	C	M
	2	0	2	3	100

COURSE OBJECTIVES:
This course will enable the student to:

- Design interactive user interfaces for real time web applications.
- Apply the knowledge of client and server-side scripting in the given scenarios.
- Apply the knowledge of server-side scripting in the given scenarios.
- Implement the concepts of advanced server side scripting in the real time scenarios
- Connect the front end with databases and deploy the application in cloud server or in a local server.

UNIT I - UI DEVELOPMENT   8

Introduction to Bootstrap BS4: Containers – Topography - UI elements – Grid – JS Components - JS Alert – JS Button – JS Modal – JS Tab – JS Toasts – JS Tooltip.

UNIT II – CLIENT-SIDE SCRIPTING   10

JQuery : Introduction-Basics - Syntax – Selectors - Events – JQuery HTML -Get – set – add – remove – CSS classes - Dimensions– JQuery traversing -Ancestors – Descendants – Sibling – Filtering - JQuery AJAX- Load- Get/Post

UNIT III – BASICS OF PHP SERVER-SIDE SCRIPTING   9

PHP Basics – Installation – Syntax – Comments – Variables – Datatypes – Strings – Constants – Loops – If ..else – Arrays – RegEx- OOPS – Classes and objects – Constructors – De- constructor- Access modifiers – Inheritance – Constants – Abstract classes – Interfaces – Static methods – Properties – Iterables

UNIT IV – ADVANCED CONCEPTS OF PHP SERVER SIDE   10

PHP FORMS – PHP AJAX – Database – XML – Live Search – Poll– PHP File Handling – PHP JSON – PHP sessions – Filters – Call-back functions – RESTAPI development using POSTMAN tool.

UNIT V – DATABASE AND DEPLOYMENT   8

Creating a database in MariaDB – Creating a table in MariaDB- PHP functions in MariaDB - Connecting MariaDB with PHP – Checking the connection – Executing the request – Deployment in cloud server – Google cloud – Amazon - Deployment in Local Server – XAMPP.

TOTAL = 60 Hours

LIST OF PROGRAMS:

1. Design a responsive web page that uses the features of Bootstrap.(Unit I)

2. Create the following simple applications in JQuery (Unit II)

- Create a Zebra Stripes table effect
- Scroll to the top of the page
- Restrict "number"-only input for textboxes including decimal points
- Animate an element, by changing its height and width
- Toggle between fading in and fading out different boxes

3. Create the following simple applications in PHP (Unit III)

- Sorting arrays in descending numerical order
- PHP form validation
- PHP super globals – $_GLOBAL, $_REQUEST, $_POST, $_GET,$_SERVER
- Regular expressions to do a case – insensitive count of the number of occurrences of a particular string
- Connect, login, and close an FTP connection
- Send a simple email

4. Design a simple application that uses the Geolocation API to return the coordinates of where the browser is located.(Unit IV)

5. Create a simple user registration and login web application using the features of Bootstrap, JQuery, PHP, WEB API and MariaDB. (Unit V)

6. Development of a dashboard application using Bootstrap, HTML5 and PHP REST API (Unit V)

COURSE OURCOMES:

- Design top-notch unique user interface design that enhances the visual representation of an application.

- Develop efficient client-side script that respond immediately to user's actions and do not require trip to the server.

- Create resourceful dynamic web pages using scripts on web server

- Apply server-side scripts in real time applications that retrieve and generate content

- Develop a web application that connects front end with back end and deploy it in the cloud or local server.

REFERENCES:

1. Jorg Krause, "Introducing Bootstrap 4: Create Powerful Web Applications Using Bootstrap 4.5", Apress, Second edition, 2020 (Unit I).
2. Jacob Lett, "Bootstrap Reference Guide: Bootstrap 4 and 3 Cheat Sheets Collection",Bootstrap Creative, 2018 (Unit I)
3. Jennifer Kyrnin , Bootstrap in 24 Hours, Sams Publishing,First edition , 2015 (Unit I)
4. Mary Delamater,Zak Ruvalcaba,"Murach's Javascript and JQuery",Mike Murachs and Associates, Fourth Edition , 2020(Unit II).
5. Adrian W. West, Steve Prettyman ," Practical PHP 7, MySQL 8, and MariaDB Website Databases: A Simplified Approach to Developing Database-Driven Websites", Apress, Second Edition, 2018 (Unit III,IV,V)
6. Russell J.T. Dyer, Learning MySQL and MariaDB, O'Reilly Media, First Edition, 2015 (Unit V).
7. Benjamin Jakobus, Jason Marah , "Mastering Bootstrap 4" Packt Publish(unit I)ing Limited, 2016.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA512.1	Design top- notch unique user interface design that enhances the visual representation of an application.	3	2	2	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA512.2	Develop efficient client-side script that respond immediately to user's actions and do not require trip to the server.	3	1	1	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA512.3	Create resourceful dynamic web pages using scripts on web server.	3	3	3	1	2	3	3	3	2	3	3	3	3	1	1
P20MCA512.4	Apply server-side scripts in real time applications that retrieve and generate content.	3	1	1	3	2	2	2	2	2	2	1	2	3	3	3
P20MCA512.5	Develop a web application that connects front end with back end and deploy it in the cloud or local server.	3	3	3	2	3	2	2	2	2	2	3	2	1	3	3

P20MCA513 – MICROSERVICES AND DEVOPS

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Explain an overview of Microservices and Containers.

- Understand the key concepts and principles of DevOps

- List the most common DevOps tools

- Identify the business benefits of DevOps and continuous delivery.

- Recall the specific DevOps methodologies and frameworks.

UNIT I – INTRODUCTION TO MICROSERVICES   **9**

Definition of Micro services – Characteristics – Micro services and Containers – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud.

UNIT II - MICROSERVICES ARCHITECTURE   **9**

Monolithic architecture- Micro service architectural style- Benefits - Drawbacks of Micro service architectural style - decomposing monolithic applications into Micro services.

UNIT III - BASICS OF DEVOPS   **9**

History of DevOps- DevOps and software development life cycle- water fall model – agile model –DevOps life cycle – DevOps tools: distributed version control tool –Git- automation testing tools – Selenium - reports generation – TestNG - User Acceptance Testing – Jenkins.

UNIT IV - MICROSERVICES IN DEVOPS ENVIRONMENT   **9**

Evolution of Micro services and DevOps – Benefits of combining DevOps and Micro services working of DevOps and Micro services in Cloud environment - DevOps Pipeline representation for a Node JS based Micro services.

UNIT V - VELOCITY AND CONTINUOUS DELIVERY   **9**

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and Devops- Infrastructure and the job of Ops.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Understand the Micro services and containers.
- Explain the architecture of Micro services.
- Describe DevOps and the common tools used in DevOps.
- Apply Micro services in DevOps.
- Develop, integrate and deploy projects using DevOps.

REFERENCES

1. NamitTanasseri, RahulRai, "Microservices with Azure", 1st Edition, Packt Publishing, UK, 2017.
2. Eberhard Wolff, "Microservices: Flexible Software Architecture", 1st Edition, Pearson Education, 2017.
3. James A Scott, "A Practical Guide to Microservices and Containers", MapR Data Technologies 2016, e – book.
   https://mapr.com/ebook/microservices-andcontainers/assets/microservices-and-containers.pdf
4. Joyner Joseph, Devops for Beginners, First Edition, MihailsKonoplovs publisher, 2015.
5. Gene Kim, Kevin Behr, George Spafford, The Phoenix Project, A Novel about IT, DevOps, 5th Edition, IT Revolution Press, 2018.
6. Michael Hüttermann, DevOps for Developers, 1st Edition, APress, e-book, 2012.

CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA513.1	Understand the Micro services and containers.	3	2	2	2	3	3	3	3	2	3	3	3	3	3	1
P20MCA513.2	Explain the architecture of Micro services.	3	1	3	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA513.3	Describe DevOps and the common tools used in DevOps.	3	3	3	2	2	3	3	3	2	3	3	3	3	1	1
P20MCA513.4	Apply Micro services in DevOps.	3	1	1	3	2	2	2	2	2	2	2	2	3	3	3
P20MCA513.5	Develop, integrate and deploy projects using DevOps.	3	3	3	2	3	2	2	2	2	2	3	2	3	3	3

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P20MCA534 – DIGITAL MARKETING

	L	T	P	C	M
	3	0	0	3	100

COURSE OBJECTIVES:

This course will enable the student to:

- Understand the basic concepts of digital marketing
- Gain knowledge on SEO optimization
- Discuss the functionalities of Social media marketing
- Discuss the significant role of pay per click marketing
- Understand web analytics and webmaster tools

UNIT I - BASICS OF DIGITAL MARKETING   9

Introduction To Online Digital Marketing –Evolution of Digital Marketing – Definition of Digital Marketing - Need of Digital Marketing- Internet marketing - Traditional vs. Digital Marketing-Digital Marketing metrics and channels – Customer centricity - Types of Digital Marketing – Search Engine Optimization – Search Engine Marketing – Social Media marketing – Content Marketing – Email Marketing – Mobile Marketing – Marketing Analytics – Affiliate Marketing -Increasing Visibility-Visitors Engagement- Targeted traffic-Lead generation – digital branding strategy.

UNIT II – SEARCH ENGINE OPTIMIZATION (SEO)   9

Introduction to Search Engine Optimization-Search Engine working principle-SEO Fundamentals and Concepts-Understanding the SERP-Google processing-Indexing-Crawling-Content Marketing – On–Page Optimization-Domain selection-Hosting selection-Meta data optimization-URL optimization-Internal linking-Image optimization-Landing page optimization-No-Follow and Do-Follow- Off-Page Optimization - Link building tips and techniques-Difference between white hat and black hat EO-Alexa rank, Domain-Link acquisition techniques-Profile link creations-Image submission.

UNIT III – SOCIAL MEDIA MARKETING (SMM)   9

Facebook optimization -Fan page vs Profile vs Group-Creating Facebook page for business-Increasing fans and Marketing-Facebook analytics-Facebook advertising and its types -Creating advertising campaigns-Payment modes-Introduction to twitter-Creating Strong profiles on Twitter-Followers, Re-Tweets, Clicks-Conversions, Hashtags-LinkedIn Optimization-LinkedIn-Individual profile Vs. Company profile-Branding on LinkedIn-Marketing on LinkedIn groups- Google$^+$-Tools and Techniques-Google$^+$ Groups- Google$^+$ for business.

UNIT IV – PAY PER CLICK MARKETING (SEM)   **9**

Google AdWords -Introduction to Online Advertising and AdWords-AdWords account and campaign basics-AdWords targeting and placement-AdWords bidding and budgeting-AdWords tools-Opportunities-Optimizing Performance-Ads type-Bidding strategies-Search network-Display network-Shopping Ads-Video - Ads-Universal App - Ads-Tracking Script remarketing-Performance monitoring reports.

UNIT-V - WEB ANALYTICS AND WEBMASTER TOOLS   **9**

Google Web Analytics - getting started with Google Analytics-Navigating Google Analytics-Real-Time monitoring-Audience-Acquisition-Traffic sources-Behavior-Content-Visitors-Live Data-Demographics-Web master tools - Adding site and verification-Setting Geo-target location-Search queries analysis-Filtering search queries-External links report-Crawls stats and errors-Sitemaps-Robots.txt and links removal-HTML suggestion.

TOTAL = 45 Hours

COURSE OUTCOMES:

At the end of the course the student should be able to:

- Analyze the need of digital marketing in various businesses.
- Apply the techniques of SEO to optimize the content and display it to the target users.
- Examine the social media platforms to market a product or a service.
- Create real time applications that increase the rankings on search engines through paid means.
- Implement web analytics in real time applications.

REFERENCES

1. Dave Chaffey, Fiona Ellis Chadwick "Digital Marketing- Strategy, Implementation and Practice", Pearson,7th Edition, 2019 (Unit I).

2. Subhankar Das, "Search Engine Optimization and Marketing – A recipe for success in digital marketing", Chapman and Hall/CRC, 1st Edition, 2021(Unit II).

3. Jason Lazar, "Social Media Marketing: A Comprehensive Guide to Growing Your Brand on Social Media", Ingram publishing, 1st Edition, 2021. (Unit III).

4. Perry Marshall, Mike Rhodes, Bryan Todd, "Ultimate guide to Google Ads", Entrepreneur press, 6th Edition, 2020 (Unit IV).

5. Alexa L.Mokalis, Joel J.Davis, "Google Analytics Demystified", Create Space Independent Publishing Platform, 4th edition, 2018 (Unit V).

6. Simon Kingsnorth, "Digital Marketing Strategy: An Integrated approach to Online Marketing", Kogan Page, 2nd Edition, 2019.

7. Perry Marshall, Mike Rhodes, Bryan Todd, "Ultimate guide to Google Ads", Entrepreneur Press, 6th Edition, 2020.

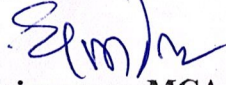| CO No	Course Outcome(CO) On completion of the course the student should be able to :	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l	PO m	PSO a	PSO b
P20MCA534.1	Analyze the need of digital marketing in various businesses.	3	2	2	2	3	3	3	3	2	3	3	3	3	3	1
P20MCA534.2	Apply the techniques of SEO to optimize the content and display it to the target users	3	1	3	2	3	3	3	3	2	3	3	3	3	1	1
P20MCA534.3	Examine the social media platforms to market a product or a service.	3	3	3	2	2	3	3	3	2	3	3	3	3	2	2
P20MCA534.4	Create real time applications that increase the rankings on search engines through paid means.	3	1	1	3	2	2	2	2	2	2	2	2	3	3	3
P20MCA534.5	Implement web analytics in real time applications.	3	3	3	2	3	2	2	2	2	2	3	2	3	3	3

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Sona College of Technology, Salem
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Courses of Study for MCA IV Semester under Regulations 2020
Branch: Master of Computer Applications

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
		Practical					
1	P20MCA401	Project Work	0	0	24	12	360
					Total Credits		12

Approved by

Chairperson, MCA BOS
Dr.T.Padma

Member Secretary, Academic Council
Dr.R.Shivakumar 22/12/23

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

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